APRIL 1951

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

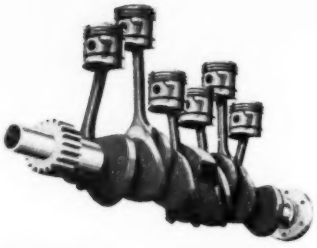
13 cuts at once triple output

... see page 2

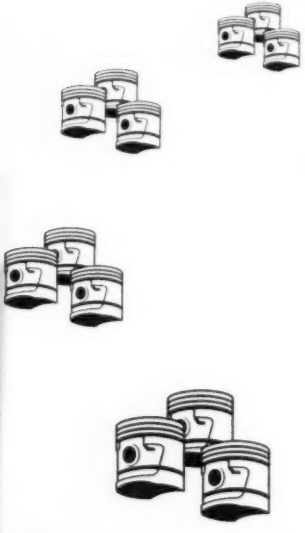
Measuring Tools...
A DEFENSE TRAINING MANUAL

Progressive Dies
Control Springback

PISTON PRODUCTION



UP 21%



New Heald Bore-Matic bores and grooves automotive pistons *three at a time*

When it comes to high speed precision production, the automotive industry has consistently set the pace. Perhaps that's because so many automotive manufacturers bring their precision finishing problems to Heald.

The installation shown below is a typical example. This new Model 322 Bore-Matic boosted piston production 21% over previous methods. The pistons are bored and grooved three at a time in a single, high-speed, automatic cycle. All the operator has to do is load the parts, throw the starting lever, and remove the finished pistons. Even the loading and unloading has been speeded up by a three-station, hydraulic clamping and locating fixture.

Remember—when it comes to precision finishing, it pays to come to Heald.

HEALD

THE **HEALD** MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

Branch Offices: Chicago • Cleveland • Dayton • Detroit
Indianapolis • Lansing • New York

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

BURNHAM FINNEY ..... Editor
E. J. TANGERMAN ..... Executive Editor

•

RUPERT LE GRAND ..... Associate Editor
BEN BROSHEER (Chicago) .. Associate Editor
ANDERSON ASHBURN .... Associate Editor
H. E. LINSLEY ..... Associate Editor
CHESTER RICKER (Detroit) .. Associate Editor
MILES J. ROWAN ..... Associate Editor

•

CHARLES D. EMERSON ..... Assistant Editor
WM. M. STOCKER, JR. ..... Assistant Editor
NORMAN FABER ..... Assistant Editor

•

SYDNEY OXBERRY ..... Art Director
RICHARD ROOMAN ..... Assistant
ANNE PALMER ..... Makeup

•

LIONEL J. HOLMES ..... News Editor
STANLEY BRAMS ..... Detroit
WM. B. WHICHARD ..... Washington
ROBERT E. COCHRAN ..... Cleveland
TED PALMER ..... San Francisco
JAMES LEE ..... Houston
E. DALTON WHITE ..... Atlanta
FREDERICK BREWSTER ..... London
BOYD FRANCE ..... Paris
J. K. VAN DENBERG, JR. .. Rio de Janeiro
JOHN CHRISTIE ..... Frankfurt
ALPHEUS JESSUP ..... Tokyo
HERBERT LEOPOLD ..... Melbourne
JOSEPH GAMBATESE ..... Labor Editor

•

DEXTER KEEZER ... Director Economics Dept.
GEORGE B. BRYANT, Jr. ..... Washington
RUSSELL F. ANDERSON. Editor World News
FRED H. COLVIN ..... Editor Emeritus

ABC ABP

ALBERT HAUPTLI ..... Publisher
WILLIAM E. KENNEDY ..... Asst. Publisher
HUGH BRITTON ..... Service Manager

•

DISTRICT MANAGERS

R. Maultsby ..... Rhodes-Haverty Bldg., Atlanta 3
J. H. Koch ..... Statler Bldg., Boston 16
W. J. Haring ..... McGraw-Hill Bldg., Chicago 11
John Tiebout ..... McGraw-Hill Bldg., Chicago 11
Robert Anderson ... 1110 Delta Ave., Cincinnati 8
Robert Anderson ..... Hanna Bldg., Cleveland 15
R. H. Burke ..... Hanna Bldg., Cleveland 15
J. H. Allen ..... First Natl. Bank Bldg., Dallas 1
Philip Weatherby .... Penobscot Bldg., Detroit 26
Carl Dysinger .1111 Wilshire Blvd., Los Angeles 17
G. H. Krimsier .. McGraw-Hill Bldg., New York 18
G. Reppert, Jr. ... McGraw-Hill Bldg., New York 18
David Jones ..... Architects' Bldg., Philadelphia 3
R. H. Burke ..... 738 Oliver Bldg., Pittsburgh 22
John Tiebout ..... Continental Bldg., St. Louis 8
John Otterson ..... 68 Post St., San Francisco 4

American Machinist is indexed regularly in the Engineering Index and the Industrial Arts Index

CONTENTS for APRIL 2, 1951

VOL. 95, NO. 7

ADMINISTRATION

Editorial ..... *Burnham Finney* 85
How to Ease the Load on Your Foremen ..... *Edmund Mottershead* 90
Tea for Two ..... *Round Table* 118

SPECIAL REPORT

Know Your Measuring Tools ..... *H. E. Linsley* 101

ENGINEERING

6 Steps to Lower Layout Costs ..... *C. G. Wallis* 96
Drill Drivers ..... *(RBS)* 127
Grinding Machine Sizes ..... *(RBS)* 131

FINISHING

Cycle-Hub Fixture Spins Buffing Work ..... *Frank Spicer* 120
Bumping Method Straightens Bent Shafts ..... *Borge Olsen* 121

HEAT TREATING & ASSEMBLY

Good Carburizing Practice—XI ..... *T. A. Frischman* 92
Is Furnace Brazing Just As Good? ..... *Samuel Damon* 98
40 Spotwelds at Once, Electronically ..... *Charles Studer* 119
Electrode Guard Squelches Spotwelding Sparks ..... *A. Leclerc* 121
Welding Pedestal Shifts to Invert Work ..... *Olin L. Brage* 122

MATERIAL CUTTING, FORMING

Hard Steel "Grilled" at a Mile a Minute ..... *J. O. Outwater* 87
Shop Shots 117
Turntable Cutting Rig Replaces Vertical Turret Lathe 120
Round Stock Provides Its Own Drill Bushing ... *James K. Robison* 121
Simple Method Broaches Boring-Bar Hole ..... *John J. Moffatt* 122
Remove Handwheel Spoke to Speed Drilling Job ..... *Dan Penway* 123
Crush-Dressing Forms Surface-Grinder Wheel ..... *Paul M. Smith* 123

TOOLING

Progressive Dies Adjust Forming Pressure ..... *Rupert Le Grand* 88
Diemaker's Kinks ..... *Federico Strasser* 100
Air Can Clamp Small Parts, Too ..... *Dr. Ing. C. Sanvero* 113
Spherical Centers Can Improve Taper Jobs ..... *John Dernoga* 120
Boring-Bar Cam Shifts Tool to Cut Helical Groove. *Henry J. Gifford* 122
Registering Fixture Clamps in Two Directions ..... *Robert Mery* 123
Internal Chaser Made from Tap ..... *Frank M. Butrick, Jr.* 124
Shaper-Grinder Setup Forms Cutter Angles ..... *Gordon Smith* 124

NEWS OF METALWORKING

Spot News 71
Washington 73
Detroit 75
Machine Tools 77
Gaging Metalworking 81
Names in the News 138

DEPARTMENTS

Backlash 66
Reference Book Sheets 127
Talking Shop 133
Equipment Materials Parts 140
Subcontracting News 181
Round Table Discussion 160
New Books 192

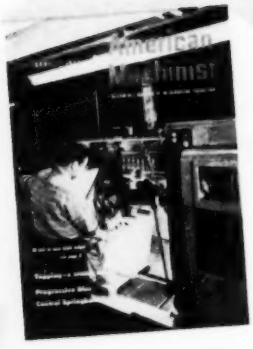
AMERICAN MACHINIST, published bi-weekly by McGraw-Hill Publishing Company, Inc., James H. McGraw (1860-1948), Founder.

EXECUTIVE, EDITORIAL, ADVERTISING AND PUBLISHING OFFICES: McGraw-Hill Building, 330 West 42nd Street, New York 18, N.Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President, Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President, Director of Advertising; J. E. Blackburn, Jr., Vice President, Director of Circulation.

SUBSCRIPTIONS: Address correspondence to American Machinist-Subscription Service, 330 West 42nd Street, New York 18, N. Y. Allow ten days for change of address. Please indicate position and company connection on all subscription orders.

Single copies, 50c. Subscription Rates—United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada $7 for one year, $11 for two years, $14 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 for one year, $30 for two years, $40 for three years. Entered as second-class matter, August 13, 1943, at Post Office, New York, N.Y., under the act of March 3, 1879. Printed in U.S.A.

Copyright 1951 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved.



Chips and QUIPS

Production Up 275% . . . Badger Meter Mfg. Co., Milwaukee, installed the Warner & Swasey 6-in. 5-spindle chucking automatic shown on our cover primarily to step up production. It did just that; output on the standard register housing, used on all Badger meters for liquids, rose from 80 to 300 pieces per hour. But in addition, better surfaces and closer tolerances were attained.

Operations are: 3 rough borings, 3 rough facings, three finish borings, three finish facings, and a groove cutting. This is Badger's second W & S.

Grilling . . . Neither a D. A.'s inquiry nor a synonym for broiling, "grilling" is the coined name of the milling process done at grinding speeds Dr. J. O. Outwater reports in our lead article. He has milled hardened bearing steel successfully at mile-a-minute surface speeds. We heard echoes of his research a year ago at MIT, were intrigued by his plan to study grinding by producing a measurable-tooth "grinding wheel"—really a fly-cutter. Here's a corollary result that offers interesting prospects for someone willing to try it—and some more supporting evidence for some of our rasher guesses on high-speed cutting.

Furnace Brazing . . . Are furnace-brazed joints as strong as those brazed in other ways? S. Damon, metallurgical engineer at Westinghouse (see biography), set to work to find out. He made careful tests, reported herewith, also found some indication that strength of the base material is a factor in strength of the joint. Should settle some questions and raise some new ones.

Very Progressive Die . . . Rupert LeGrand's first opus on a progressive die at John Volkert Metal Stampings, Inc. (*AM*, Dec. 11, 1950, p133) drew so many favorable comments that he's describing three others at 4-week intervals, the first in this issue. . . . Also for toolmakers is a 4-page picture article from Italy, describing use of air clamps for holding small parts there.

Less Work . . . Continuing our plan to help you in obtaining efficient supervision, we bring "Ease the Load on Your Foremen". They're key men as production rises, a spot where it's easy to create efficiency or to lose it. Be sure they're doing what they're supposed to do and can do best, not something other people should be doing.

Made to Measure . . . Associate Editor "Jim" Linsley has been doing some overtime thinking about training machine operators. His 27 years as a tool engineer and his experience in a couple of World Wars suggested that a bulge in production means thousands of training-seeking newcomers. Hence, he recently produced "Know Your Hand Tools" (*AM*, May 29, 1950). In this issue he offers 12 pages more, "Know Your Measuring Tools." Reprints will, of course, be available.

6 Steps . . . C. G. Wallis, director of the HQ Mfg Engrg Dept at Westinghouse Electric, describes a new process by which completed shop-layout prints can be obtained without tracing.

Coming . . . April 16 *AM* will be our Materials Handling Show number, with a lead article on mechanical handling and a show in print of the new handling equipment presented at the Show (opening April 30). There'll be a Special Report describing 50 years of development in production methods and equipment and methods at Saco-Lowell—*but done in four years.* It's a startling re-equipment story showing many associated development steps. There'll be stories on trimming dies, cam-actuated fixtures, deburring, the shop steward, and the final installment on carburizing.

BRAZER . . . S. Damon was graduated from the University of Pittsburgh in 1936 with a BA in Chemical Engrg. During the next six years, he worked with Lipman Engrg Co and the QM Dept, U.S. Marine Corps, as a civilian employee. After he joined Westinghouse in October, 1942, he became mainly concerned with atmosphere heat treatment and furnace brazing, has written several articles on phases of his work. In 1946, he received a second degree from his Alma Mater, this one a BS in Metallurgy.

Griller . . . Dr. J. O. Outwater, an American born in London, received his BA and MA degrees in mechanical sciences from the University of Cambridge, where he was awarded a Senior Scholarship. He served with the Royal Electrical and Mechanical Engineers between 1943 and 1947, when he entered the Massachusetts Institute of Technology. He was awarded the Timken Roller Bearing Fellowship and received his ScD degree in 1950.

Dr. Outwater is now employed in the Engineering Department of du Pont, authored our lead article.

QUENCHING PRESSES TO MEET *YOUR* REQUIREMENTS

GLEASON NO. 16 QUENCHING PRESS FIRST

Gleason Quenching Presses are an integral part of every industrial unit where the heat treatment of metal parts is required. If your needs are for a press capable of distortion-free quenching at faster production rates than heretofore possible, Gleason Works now provide three different models; the No. 16 with a 15" capacity, the No. 26 with a 24" capacity, and the No. 36 with a 36" capacity.

GLEASON NO. 26 QUENCHING PRESS NEXT

and NOW...

GLEASON NO. 36 QUENCHING PRESS

Note the advantages the New Gleason Quenching Press provide:

- **Controlled quenching at faster and safer production.**
- **Simplified set-ups.**
- **Metallurgically correct oil flow.**
- **Safer loading.**
- **Quenching without distortion.**

Write for literature. Send in prints of parts to be quenched for our recommendations.

BUILDERS OF BEVEL GEAR MACHINERY · FOR OVER EIGHTY-FIVE YEARS · GLEASON

GLEASON WORKS

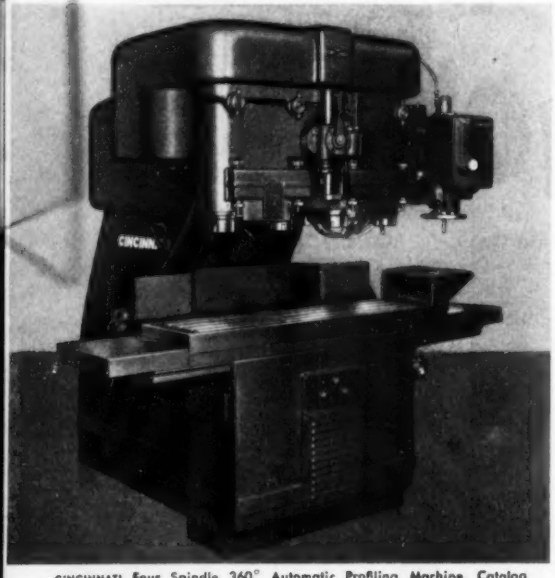
1000 UNIVERSITY AVENUE · ROCHESTER 3, NEW YORK

An easy and economical way

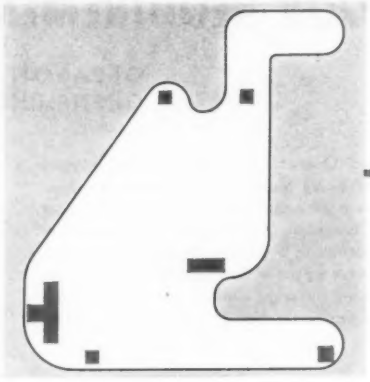
to mill isolated flat surfaces

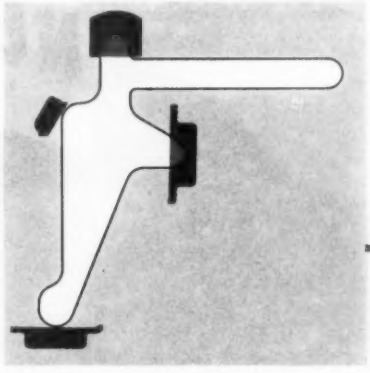
Here's a new twist that may save you time and money in machining isolated bosses or pads. When a number of machined "islands" are in the same plane, mill them by the automatic profile method. In effect, you're not profile milling, but the automatic profile control unit guides the cutters over each pad in the shortest possible distance. ¶ CINCINNATI Four Spindle 360° Automatic Profile Milling Machines offer you the most productive and lowest cost possibilities for work of this type. One, two, three or four spindles may be put to work, depending upon size of the part and production requirements. There are 20 spindle speeds; 125 to 3800 rpm . . . infinite number of feeds, 1" to 35" per minute. Three examples of the automatic profile control method of milling are illustrated at the right. The drawings indicate the path taken by the cutters, and the color spots the pads milled. Templates can readily be made from ordinary sheet metal. ¶ Complete information about these Automatic Profile Millers may be obtained by writing for catalog No. M-1215-3. Brief data will be found in Sweet's File for Mechanical Industries.

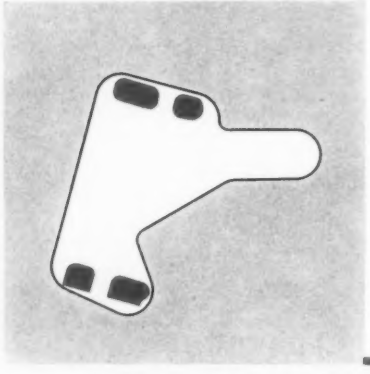
THE CINCINNATI MILLING MACHINE CO.
CINCINNATI 9, OHIO



CINCINNATI Four Spindle 360° Automatic Profiling Machine. Catalog No. M-1215-3 contains complete specifications.

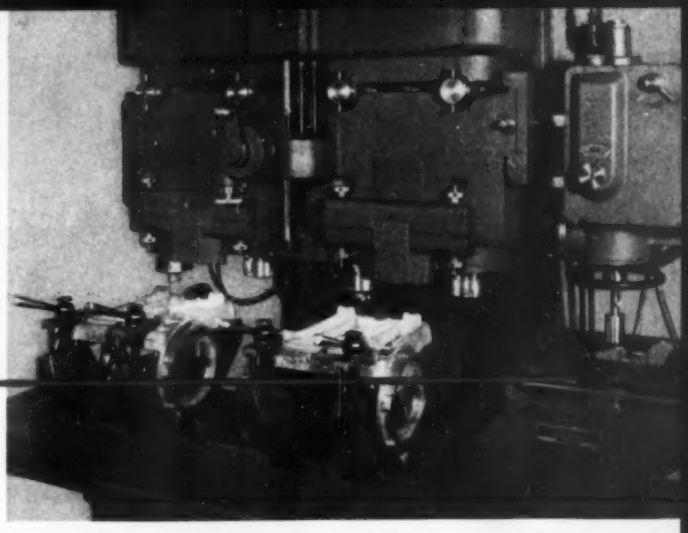




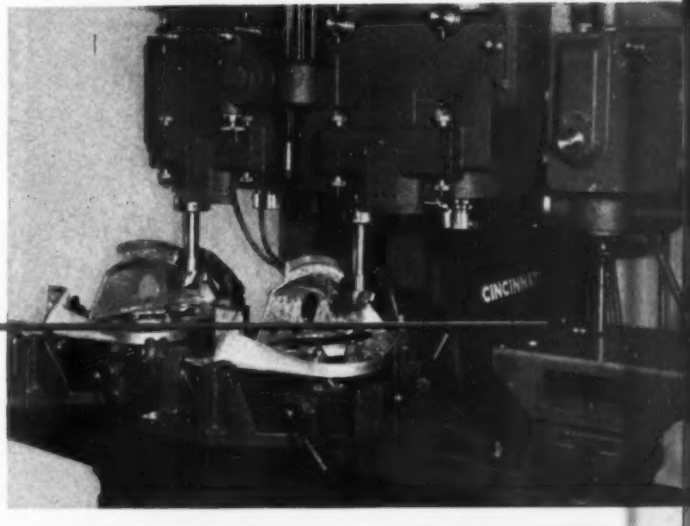


CINCIN

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • FLAME HARDENING MACHINES

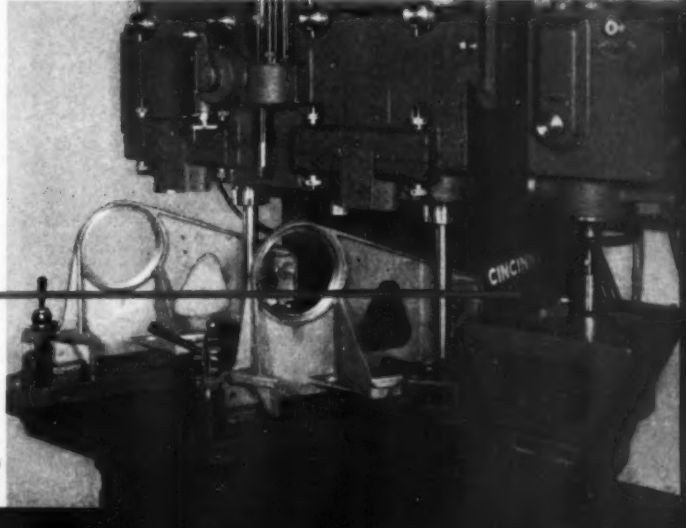


Milled by the automatic profile control method—six pads on aluminum saddle brackets. Production data: machine, CINCINNATI Four Spindle 360° Profiler . . . speed 2215 rpm . . . feed 26" per minute . . . approximate production 28 per hour.



Milled by the automatic profile control method—four pads on aluminum saddle supports. Production data: machine, CINCINNATI Four Spindle 360° Profiler . . . speed 1080 rpm . . . feed 10" per minute . . . approximate production 22 per hour.

CINCINNATI

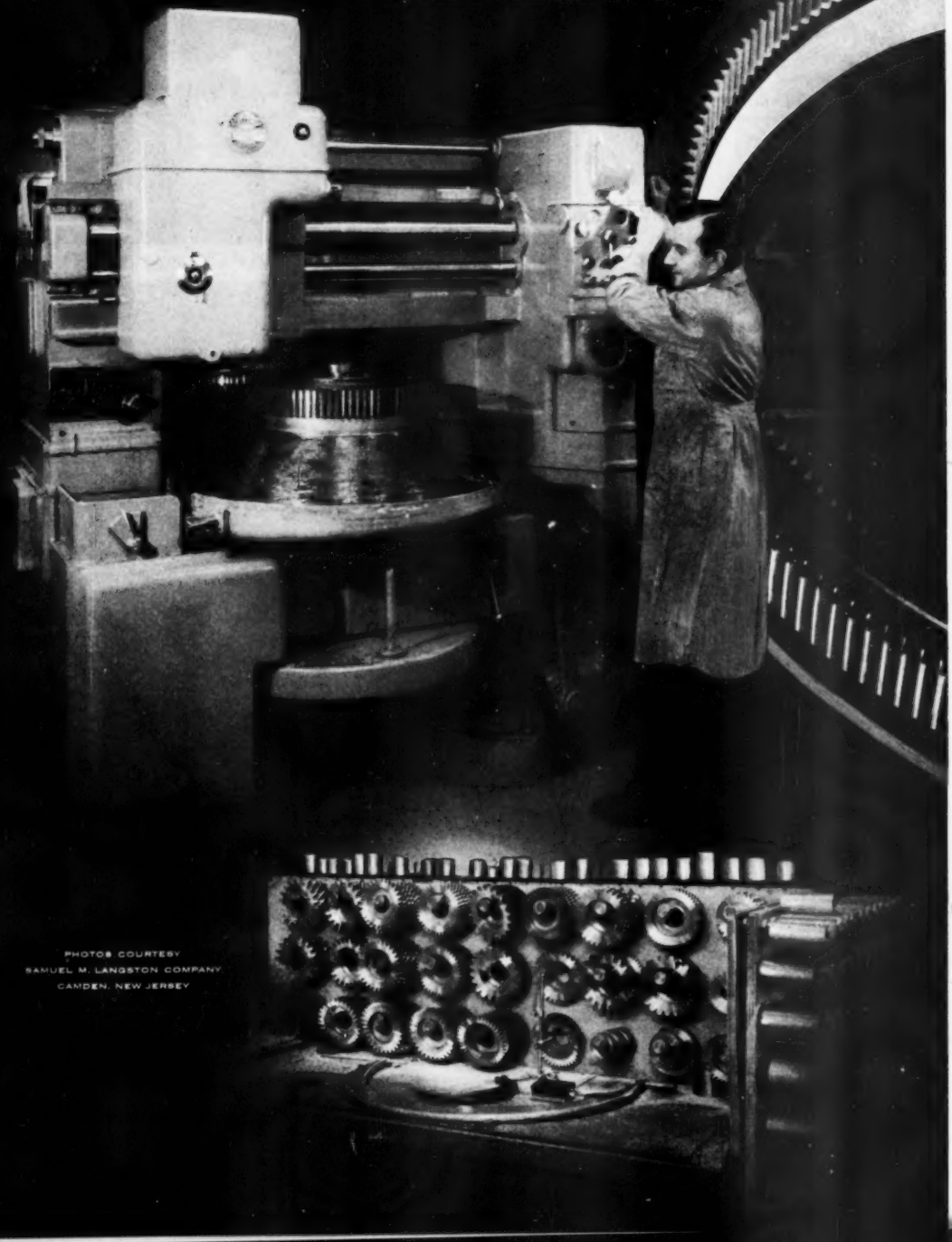


Milled by the automatic profile control method—four pads on these odd shaped aluminum parts. Production data: machine, CINCINNATI Four Spindle 360° Profiler . . . speed 2215 rpm . . . feed 9" per minute . . . approximate production 34 per hour.

NATI

OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

A Production-run



PHOTOS COURTESY
SAMUEL M. LANGSTON COMPANY
CAMDEN, NEW JERSEY

Specialist...with

Jobbing Shop FLEXIBILITY

The fundamental all-purpose Machine for any Gear Shop... Fellows 36-Type Gear Shaper

Ultra-modern design in this general-purpose machine, provides a combination of advantages never before available:

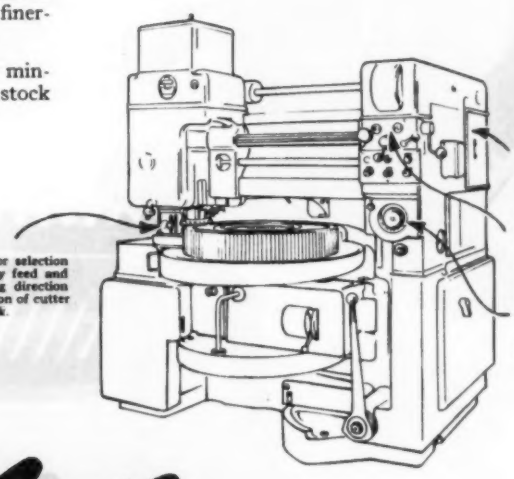
You can cut spur or helical gears—from broad-face pinions up to gears of 36" p.d.—external *or internal*. You can cut herringbone gears, cams, ratchet teeth, splines, special contours, etc.

You can use .034" feed and "rough-out" a coarse-pitch gear or pinion—fast! Or maybe a quick shift-over to fine feed in finish-cutting on finer-pitches.

You can have 300 strokes per minute cutter-spindle speed for fast stock removal on a thin blank gear. Or any one of 12 changes, down to 18 strokes per minute in taking heavy cuts on wide-face gears.

You can cut up to 6 inches face width on the standard machine.

With an assortment of standard cutters you are ready to turn out multiple production runs, fast—or shift from one item to another "with the greatest of ease". Whatever your tooling situation at the moment, if you've cost cutting in mind, it will pay you to get complete details at the nearest Fellows office on the 36-Type Fellows Gear Shaper.



Behind quick access door, simple adjustment controls the length of stroke (up to 6" face width standard).

Control for quick selection of twelve different cutter speeds. (Strokes per minute.)

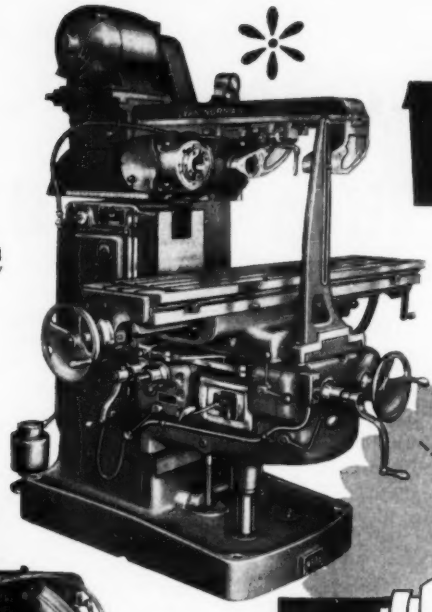
Dial setting for number of cuts to be taken, automatically stopping machine when cycle completed.

Lever for selection of rotary feed and changing direction of rotation of cutter and work.

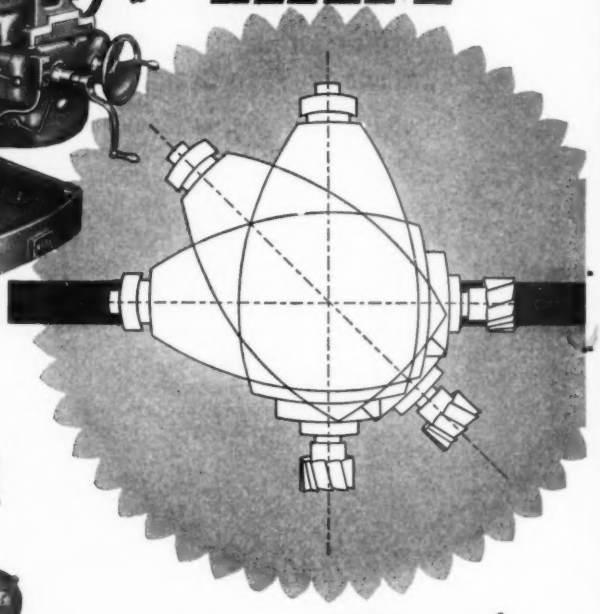
Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1

VAN RAM

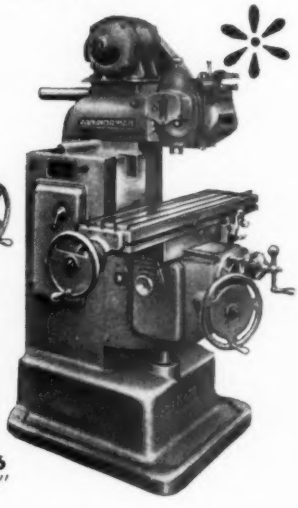


MODEL NO. 38
Table: 64″ x 14″



MODEL NO. 26
Table: 58″ x 13″

MODEL NO. 22L
Table: 45″ x 10″



MODEL NO. 16
Table: 37″ x 9½″

NORMAN TYPE MILLERS

Give You Every Advantage For Increasing Machine and Operator Output

ADJUSTABLE CUTTERHEAD ELIMINATES IDLE MACHINE TIME — CUTS MILLING COSTS!

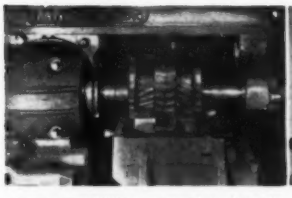
Van Norman Ram Type Millers give you every advantage for reducing milling costs

The adjustable cutterhead, which permits vertical, horizontal or angular milling on one machine, cuts idle machine time by as much as 50%. The moveable ram plus the saddle cross feed increases the work range and capacity of the miller . . . enables you to handle larger work pieces with ease. There is no waiting for single purpose machines because practically all milling operations can be accomplished on *one* Van Norman Ram Type Miller.

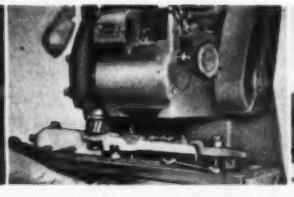
Van Norman Ram Type Millers are simple to operate. Controls are conveniently grouped for ease of accessibility. Hardened and ground steel fixed cutterhead stops permit true settings at horizontal or vertical positions. The rugged construction throughout assures accuracy and long life.

Investigate Van Norman Ram Type Milling Machines for toolroom, laboratory, pattern and die work, job shop or production milling. Available with plain or universal saddles in a wide range of sizes.

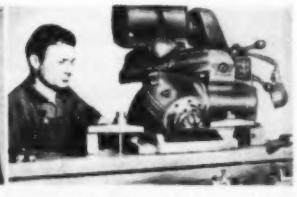
Here's How Van Norman Ram Type Millers Increase Production



Horizontal Milling — Simply lock head in horizontal position and you're ready for horizontal milling. Ram-type overarm and outer support assures rigidity and accuracy.



Vertical Milling — With the cutterhead in vertical position, the operator is ready to perform conventional vertical milling. Hardened stop set at the factory assures positive 90° setting.



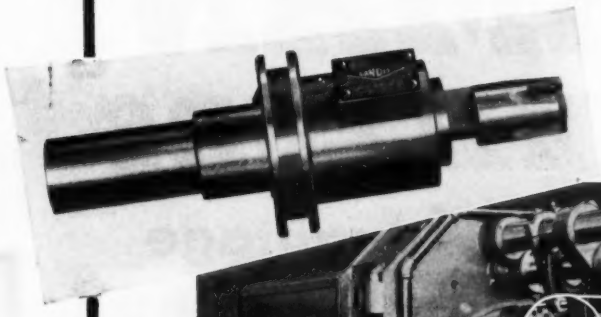
Angular Milling — Lock the cutterhead in any desired angular position and you're ready for angular milling with standard cutters. Graduated dial in degrees makes positioning easy.

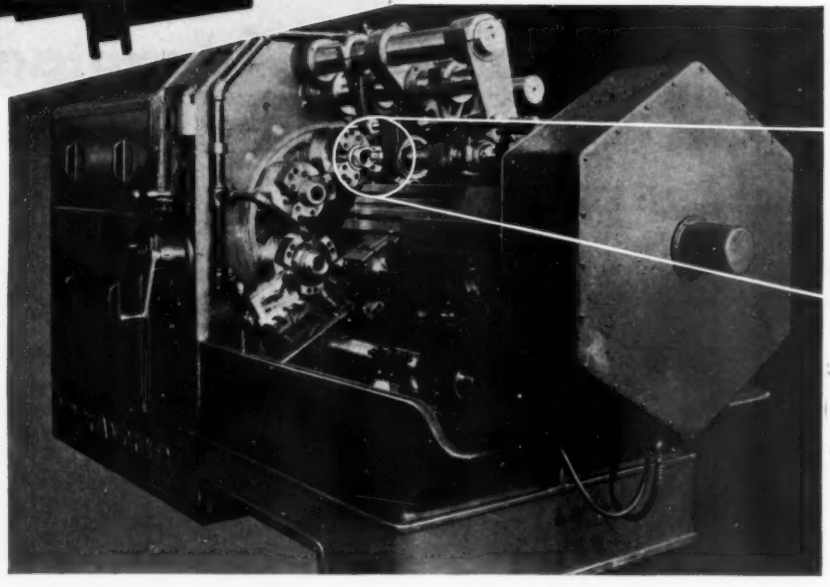
VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

AN IMPROVED

Cuts Internal





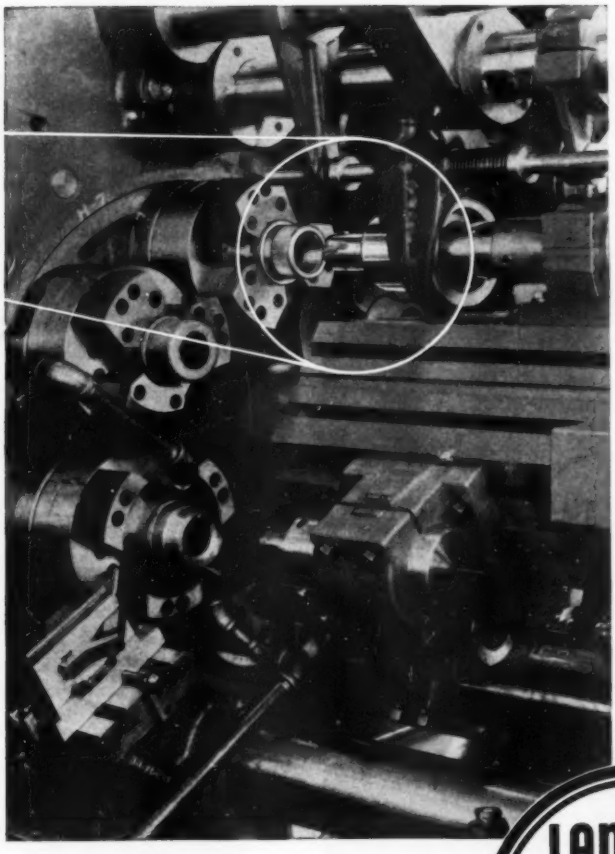
● The LL Taps are designed primarily for tapping tapered threads to A. P. I. standards. An outstanding feature is the detachable tap head permitting the use of various size tap heads to cover a wide range of thread sizes with a minimum amount of equipment.

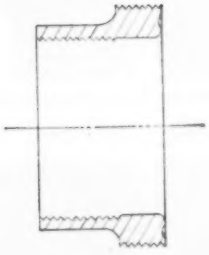
● In the improved Style ALM Heads, where an even number of chasers is used, no two chasers are directly opposite each other. This adds greater rigidity for the tap and permits the use of greater radial clearance, giving a freer cutting action with resulting increased chaser life. The Style LL Tap Body is made in four sizes to cover a range of nominal pipe sizes from 1" to 12", inclusive.

THE WORLD'S LARGEST MANUFACTURER OF

Landis TAP

Tapered Threads at 30 ft. per min.





• Using the new Landis Style LL Receding Chaser Collapsible Tap on an automatic screw machine, 2" 11½ pitch tapered pipe threads 1-5/16" long are tapped in quick change unions for oil field use at the rate of 30 feet per minute. The unions are cold worked forging 2⅜" in diameter of 185-220 Brinell hardness. The same piece is also made of malleable iron, and tapered threads are tapped at the rate of 120 feet per minute.

Write for Bulletin G-95

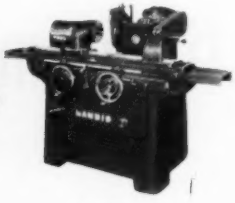
THREADING EQUIPMENT

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

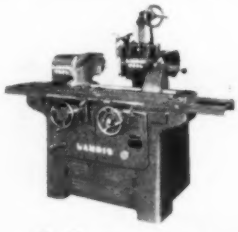
LANDIS TOOL Precision Grinders for your

UNIVERSAL GRINDERS

Production
Tool Room
Maintenance
Training



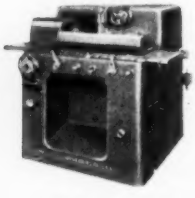
Grindwell



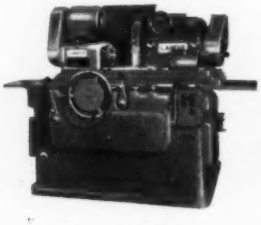
12"x 28" Universal & Tool

10"x 20" Type H Universal

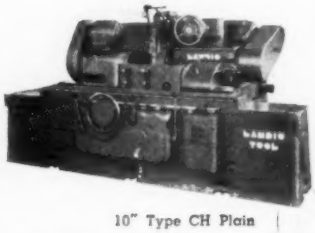
HIGH PRODUCTION PLAIN GRINDERS



4" Type H Plain



6" Type CH Plain

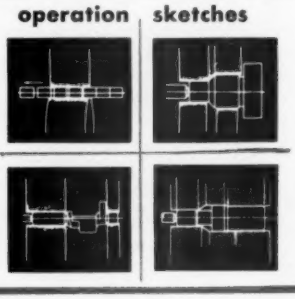


10" Type CH Plain

CENTERLESS HIGH PRODUCTION GRINDER

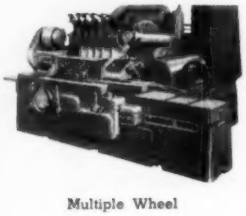
No. 12 Centerless

No. 12 Centerless

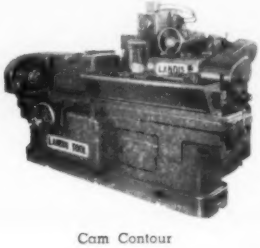


SPECIAL PURPOSE GRINDERS

Crank Pin



Multiple Wheel



Cam Contour

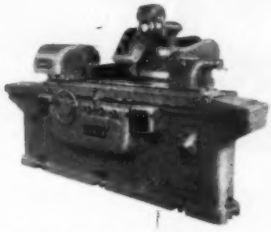
engineered grinding service

LANDIS TOOL precision grinders are easily modified for special jobs. Typical examples of these modifications are raised work centers so that work with large projections may be ground, angle wheelbases for grinding outside diameters and faces in one operation and special operating cycles for maximum production of specialized work pieces. On the basis of your blueprints, our engineers will give you production estimates and tooling recommendations.

Cylindrical Grinding needs

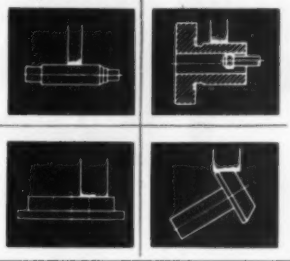
HEAVY STOCK REMOVAL
HIGH PRODUCTION
COST REDUCTION
FINE FINISH
CLOSE TOLERANCE

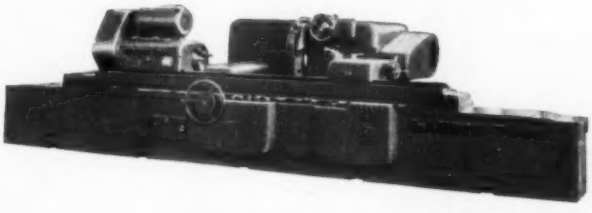
10" x 24" Type CH Universal



12" Type CH, 14"-18" Type C Universal

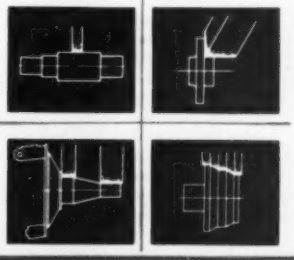
operation **sketches**





Type F Plain

operation **sketches**



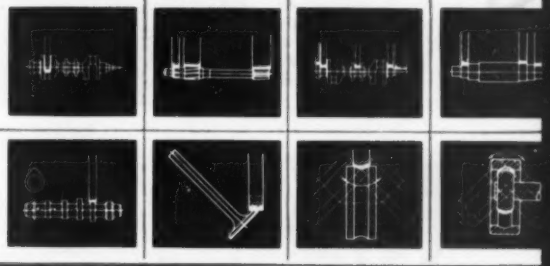
LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY • Waynesboro, Penna., U. S. A.

Valve Face

Ball Race

operation **sketches**



optional features available

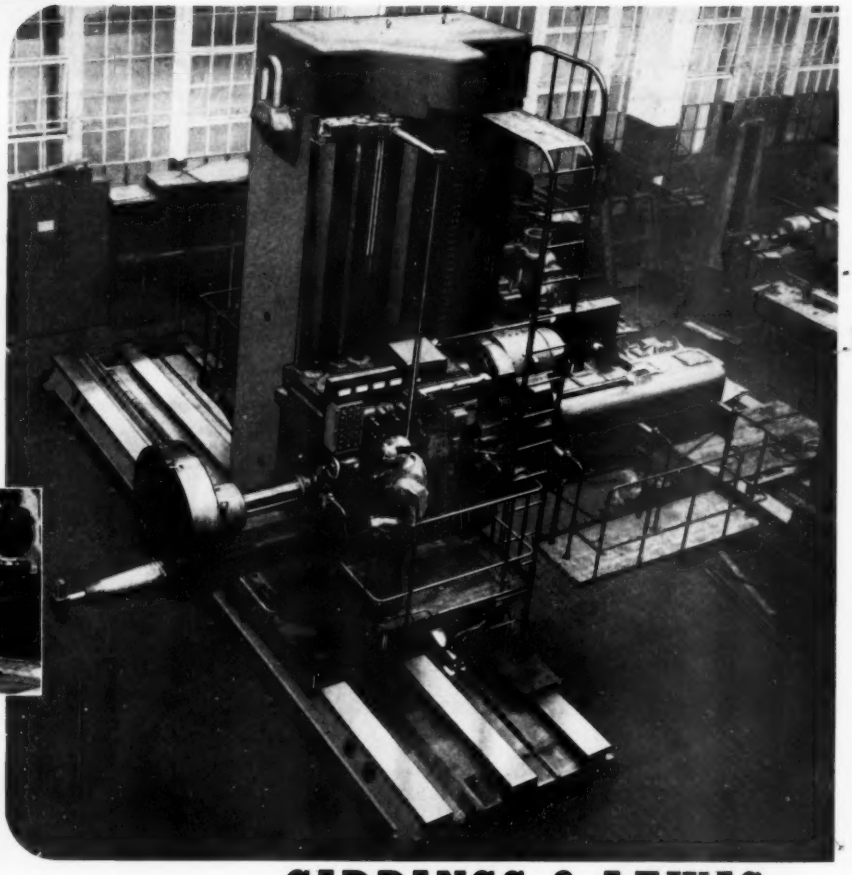
Automatic cycles
Loading fixtures
Work holding fixtures
Wheel base mounted wheel dressers
Hydraulic rapid infeed
Rapid wheel positioning
Automatic sizing
Profile wheel dressers

120 R

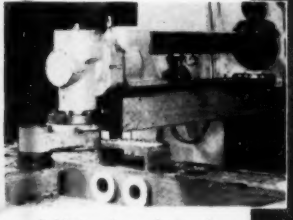
EQUIPPED WITH MICROSPHERE BEARINGS

microsphere bearing
equipped for accuracy

GET Increased Production Simplified Work Handling Greater Machining Accuracy WITH THIS



This Giddings & Lewis Floor Type Horizontal Boring Machine with under-arm ram type spindle support is capable of heavy duty industrial work. Within the range of this single, general purpose machine tool, it is possible to perform the machining operations of several special purpose production machines. A continuous feed facing head is shown on the under-arm.

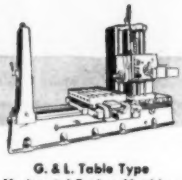


Additional reach is obtained for occasional work by using the offset spindle 90° angular milling attachment. Note extension of ram as it supports spindle and offset milling head.

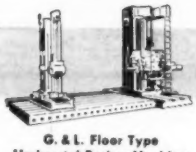
GIDDINGS & LEWIS

FOND DU LAC

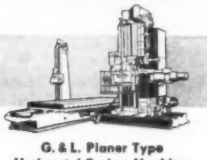
G&L HYPRO



G. & L. Table Type Horizontal Boring Machine



G. & L. Floor Type Horizontal Boring Machine



G. & L. Planer Type Horizontal Boring Machine

NEW

Floor-Type Horizontal Boring, Drilling and Milling Machine!

...FEATURING

1. Power Operated Under-arm Spindle Support

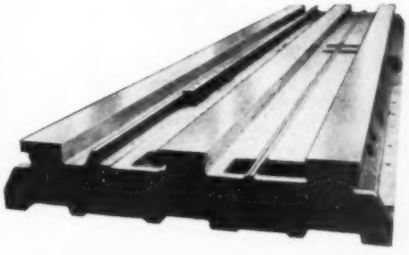
2. Hardened and Ground Runway Bearings

Manufacturers faced with the problem of increasing work output can produce more completed parts *faster, easier* and *better* with this new G. & L. Floor Type Horizontal Boring Machine equipped with a power-operated under-arm ram type spindle support. This machine component not only rigidly supports the spindle, but also provides unmatched flexibility in performing numerous machining operations in a single setting of the workpiece. The under-arm ram has a travel of 60" making it possible to bore, mill, drill, shape and profile at that distance from the machine headstock. Having 21 power feeds identical to those of the spindle, the under-arm ram may be operated independently, or engaged with the spindle for simultaneous feed.

A variety of attachments including: right angle milling head, offset milling head, continuous feed facing head, clapper box shaping unit and anti-friction roller bearing spindle support are placed on the ram for difficult machining functions. With these different auxiliary units it is practical to machine large, cumbersome work which might create setup problems if changed from original settings.

New Hardened and Ground Runways

Heavy duty, surface hardened runway bearings are now available for the first time on G. & L. Floor Type Machines. They are designed to insure continuous machining accuracy over extended periods of time. Way bearings are precision fitted to mounting surfaces and are held both flat and parallel throughout their entire length. This new machine feature insures machining accuracy on all types of work.



G. & L. machine runway equipped with hardened ways. Note the dowels locking the ways to the runway proper. This method of mounting contributes to high machining accuracy.

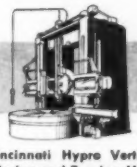
Helpful Work Recommendations

Your production problem may be readily solved with this new G. & L. Floor Type Machine having under-arm ram type spindle support. Experienced Giddings & Lewis engineers will be glad to show you how your metal working can be completed more economically on this highly versatile machine tool.

MACHINE TOOL COMPANY

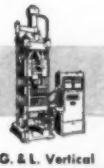
WISCONSIN, U. S. A.

Cincinnati Hypro Double Housing Planer



Cincinnati Hypro Vertical Boring and Turning Mill

Cincinnati Hypro Planer Type Milling Machine



G. & L. Vertical Plastics Injection Press

DAVIS

Complete Tooling Service

PRODUCTION jobs are not delayed where Red Shield Drills are used. STANDARD tools are uniform in construction and operating characteristics. Their production is fast—economical—dependable.

Standard "Red Shield" Service Men are always available to give you the benefit of our 70 years' of accumulated experience in mastering tough cutting tool jobs.

STANDARDIZE and save on drills, reamers, taps, dies, milling cutters, end mills, hobs, counterbores, and special tools. Sold by leading Industrial Supply Distributors coast to coast.

STANDARD TOOL CO.

3950 CHESTER AVENUE
CLEVELAND 14, OHIO

New York • Detroit • Chicago • San Francisco

STANDARD TOOL CO.

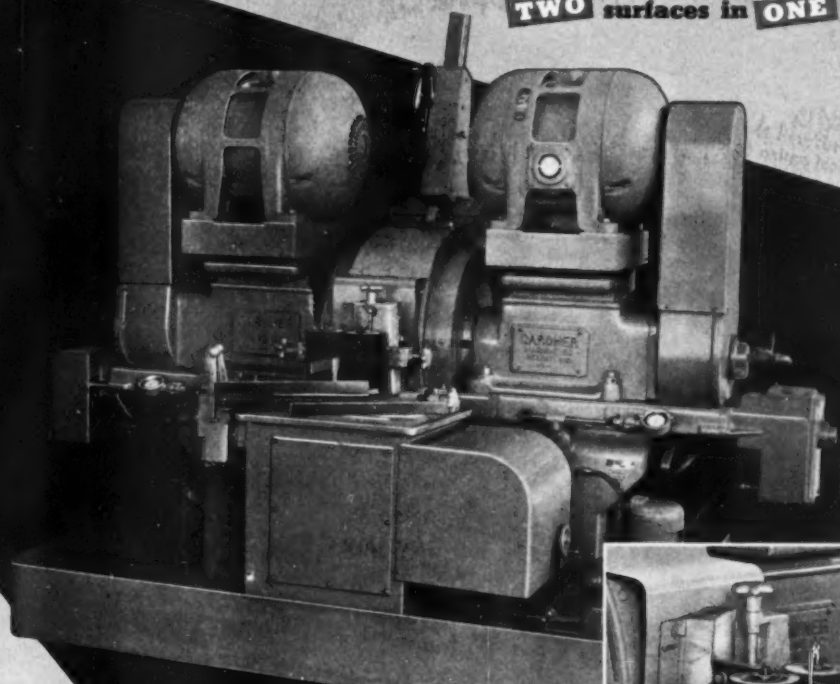
THE STANDARD LINE: ***Drills • Reamers • Taps • Dies • Milling Cutters • End Mills • Hobs • Counterbores • Special Tools***

GARDNER

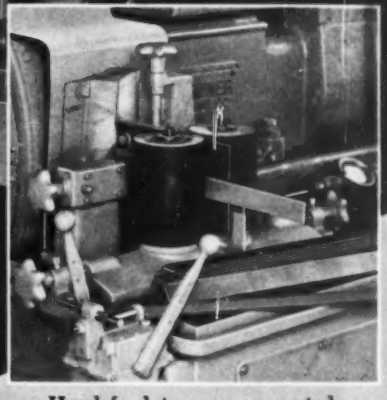
precision disc Grinders

13 Feet Per Minute Parallel Face Grinding of Steel Strips

Production increased by grinding TWO surfaces in ONE operation



480 pieces per hour—up to .015" over-all stock removal, limits .002" for uniformity, .001" for parallelism on Gardner 125-26" Double Disc Precision Grinder.



Hand feed to power-operated adjustable roll feed-thru fixture.

Request bulletin No. 12-7.

108M

GARDNER MACHINE COMPANY

410 East Gardner Street • Beloit, Wisconsin, U.S.A.

Built-In Balance Improves Toolroom Grinding When You Use...
Uniform structure assures identical cutting action throughout each wheel and from wheel to wheel . . . prevents vibration . . . allows closer tolerances, smoother finishes.
Precision, lightweight bushing maintains the new inherent balance . . . is more firmly anchored in the wheel . . . gives precision arbor fit.
Made of various Norton abrasives for fast, cool cutting of expensive high-speed steel and cast alloy tools without drawing their temper. Reduce tool spoilage.
YOUR NORTON DISTRIBUTOR NOW HAS THEM in sizes and shapes up to 12" diameter for any toolroom grinding job.
ASK FOR THEM.
NORTON
ALUNDUM

NORTON *NEW-PROCESS* GRINDING WHEELS

Truly uniform within each wheel and from wheel to wheel

NO OTHER WHEELS GIVE YOU ALL 3

1. YOU GET CLOSER TOLERANCES because the built-in balance of Norton *New-Process* Wheels reduces vibration . . . eliminates chatter marks . . . lasts for the life of each wheel.

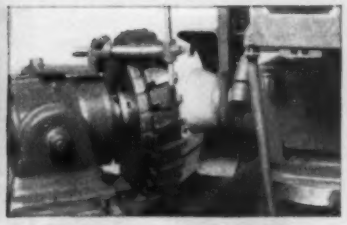
2. YOU GET MORE UNIFORM GRINDING ACTION because the more uniform structure of Norton *New-Process* Wheels causes more even wheel wear. You also have perfect confidence that all identically marked wheels *will perform identically.*

3. YOU REDUCE TOOL SPOILAGE because Norton *New-Process* Wheels, made with the *right* selection of fast, smooth-cutting Norton abrasives, allow heavier cuts in expensive, heat-sensitive, high-speed steel and cast alloy tools . . . without drawing their temper.

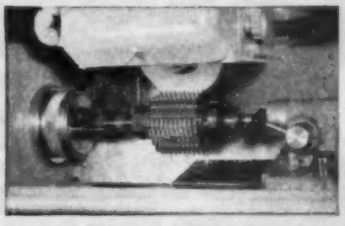
COMPARE Norton *New-Process* grinding wheels with any others in your toolroom . . . and watch production rise and costs drop. Your nearby Norton distributor or representative will help you select from the wide range of Norton tool and cutter wheels ones that will improve your toolroom grinding.

NORTON COMPANY, WORCESTER 6, MASS.
Warehouses in 5 cities. Distributors in all principal cities.

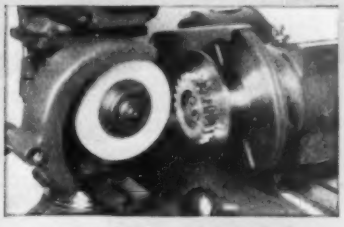
NORTON
ABRASIVES
Making better products to make other products better



ALL TEETH ARE THE SAME HEIGHT when you sharpen milling cutters with long-wearing free-cutting Norton *New-Process* Wheels . . . they hold size all the way around the cutter.



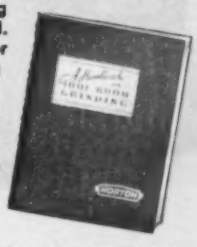
CORNERS ARE HELD, yet free cutting action maintained, when you sharpen gear cutting and splining hobs with Norton *New-Process* Alundum* Wheels.



FLAT, CHATTER-FREE SURFACES on tools and dies directly result from the built-in, work-hugging balance and dimensional accuracy of Norton *New-Process* Wheels.

FREE 160-PAGE HANDBOOK FOR TOOLROOM OPERATORS

Here's the most comprehensive guide to top-production, bottom-cost toolroom grinding ever published. Every operator should have a copy of this Handbook on Toolroom Grinding. Write for your free copy of FORM 835



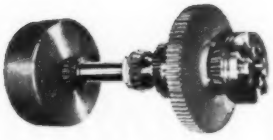
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

GREATER RIGIDITY

KEARNEY & TRECKER MILWAUKEE **CK's**

FROM overarms to column base, Kearney & Trecker CK milling machines are NEW! Look them over. You'll find these machines give you "more" of every desirable feature you need to make them more productive, more profitable for you. *Talk about rigidity* — these new CK columns are the most rigid milling machine columns we've ever designed! They give you 1000 pounds more of dense, high-test iron, scientifically distributed in closer heavier ribbing, in box section, sponson construction . . . to effectively absorb vibration from the heaviest cutting loads.

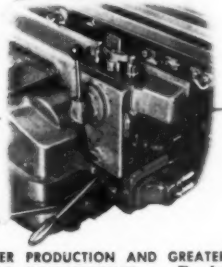
Replacement of obsolete machine tools is an



GREATER CUTTING EFFICIENCY — Added momentum of spindle-mounted flywheel assures longer cutter life and greater efficiency, through smoother, more positive drive — a key to most efficient use of modern cutting tools. Spindle rigidly supported by Kearney & Trecker's original 3-bearing design.

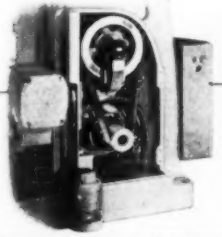
GREATER ADAPTABILITY — No. 60 Heavy Duty drive flange on Nos. 4, 5 and 6 machines enables use of heavy duty arbors with flange drive for large single or multiple cutter setups; or bolting large face-milling cutters directly to spindle nose. Average setups use standard arbors with No. 50 spindle drive.

NON-GLARE RAPID-SET DIALS — You'll avoid costly errors in reading and setting these new micrometer dials. They're vapor blasted to give you a non-glare satin surface with plenty of contrast for legibility of markings. They're easy and quick to set and provide a positive lock at every setting.

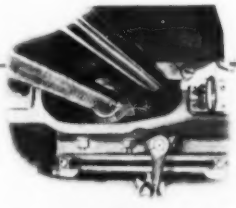


GREATER PRODUCTION AND GREATER OPERATING CONVENIENCE — Production men will like Mono-Lever Control because it reduces idle cutter time, shortens floor-to-floor cycle time. Operators will like it because it makes faster, simpler, less fatiguing work for them.

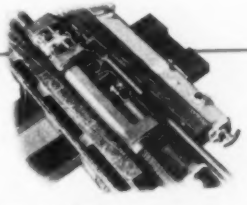
FEEDS AND SPEEDS TO TAKE FULL ADVANTAGE OF MODERN CUTTING TOOLS — and you really can do it with the broad feed and speed ranges on Kearney & Trecker's new CK milling machines. You get 24 spindle speeds (15 to 1500 rpm on Nos. 2 and 3, 13 to 1300 rpm on Nos. 4, 5 and 6) with Kearney & Trecker's automatic protecto-mesh shift to eliminate gear clashing. And there's the extra-wide feed range — 32 changes from 1/2" to 90" per minute—with separate 3 or 5 hp feed and rapid traverse drive.



GREATER HORSEPOWER — where you need it. That's what you get with new CK independent motor drives for spindle and for feed and rapid traverse. Depending on machine size (Nos. 2, 3, 4, 5 or 6), machines range from 10 to 25 hp for spindle drive and 3 to 5 hp for feed and rapid traverse.



SMOOTHER FEED PERFORMANCE — with a new design 2" diam. heavy-duty, table feed screw that affords greater bearing contact and runs through an extra-long table feed nut. These new CK machines are equipped with a backlash eliminator for more effective climb milling, more accuracy and longer screw life.



GREATER MACHINE LIFE — through automatic lubrication and generously proportioned gears and shafts throughout for overload conditions. There's a forced flood system in the column and knee, and a positive metered, pressure pump system for table, saddle and knee ways, and table feed assembly.

Kearney & Trecker's new CK Line is designed to meet every demand of present-day milling operations . . . making CK machines more accurate, and MORE PRODUCTIVE for you. Contact your nearest Kearney & Trecker representative or write direct to obtain complete specifications of these fine new machines. See how they easily replace obsolete machines at substantial savings to you. Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wis.

investment that makes both Dollars and Sense.

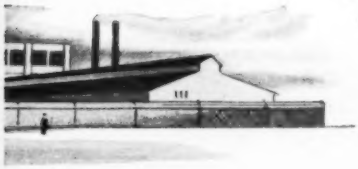
No priority required
YOU CAN MACHINE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY . . .

FOR WARNER & SWASEY SERVICE!

● In the face of today's shortages and delays, there is one thing that is not in short supply—Warner & Swasey *service!*

Across the country our Field Engineers and Service Representatives —45 factory-trained machine tool engineers—are more than ever devoting themselves to helping you get the job done.

Their suggestions may be comparatively simple—a new part, a different tool, an easy-to-make adjustment. But when our engineer leaves your plant, chances are *your turret lathes will be producing more than when he came in.* That's what we all need today, of course... more and more production... and that's one thing your Warner & Swasey man is offering today—with no priority required!

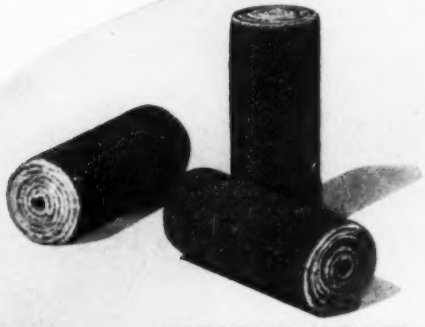


WARNER & SWASEY

MACHINE TOOLS CLEVELAND, OHIO

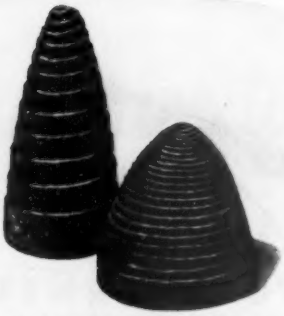
TURRET LATHES, MULTIPLE & SINGLE SPINDLE AUTOMATICS, AND TAPPING MACHINES

GOT AN UNUSUAL



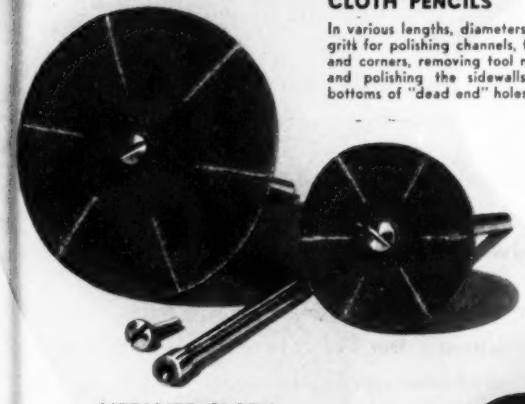
LIGHTNING METALITE CLOTH PENCILS

In various lengths, diameters, and grits for polishing channels, fillets, and corners, removing tool marks, and polishing the sidewalls and bottoms of "dead end" holes, etc.



LIGHTNING METALITE CLOTH SPIRAPOINTS

For odd shaped areas with varying radii and for high finishing after grinding with solid abrasive mounted points — many sizes and grits available.

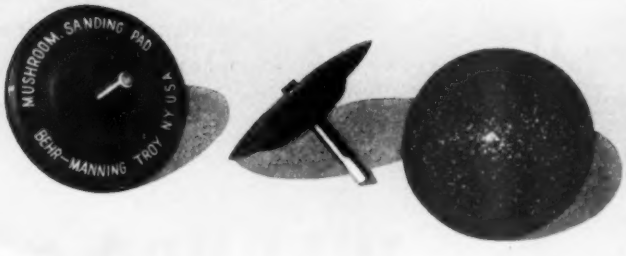


METALITE CLOTH SLOTTED DISCS

Cut to fold in, like an umbrella when pushed into a hole — just the thing for internal polishing on walls of cylinders and for deburring and radiusing the edges of round holes. Available in complete range of diameters and grits.

MUSHROOM SANDING PADS

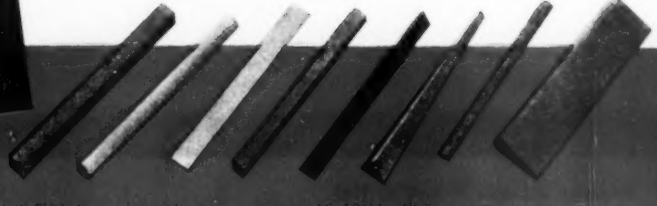
For shaping and finishing dies and moulds in various metal and rubber fabricating — also used in deburring and finishing curved or flat surfaces.



OILSTONE FILES FOR THE FINAL "TOUCH"

Over 200 different sizes and shapes of INDIA® and HARD ARKANSAS* stones enable you to fit dies, deburr an intricately shaped machine part, or put a real keen edge on precision cutting tools.

*Trade Mark



COATED ABRASIVES • SHARPENING STONES • PRESSURE-SENSITIVE TAPES

FINISHING JOB?

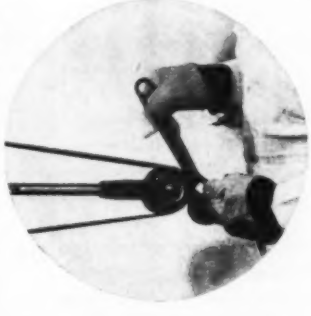
BEHR-MANNING *Special* ABRASIVE TOOLS

Maybe it's a volume job with a corner to be rounded, a channel to be polished, an edge to be deburred, an inside surface to be touched up, or a spot tough to reach for finishing.

The BEHR-MANNING Specialties shown on these pages were designed for just those kinds of jobs. Look them over — probably you'll find just what you need. In any case, if you have a special job where a few minutes saved per piece will add up to greater production, a short talk with a BEHR-MANNING Abrasives Engineer may give you that improved production. Write us. Address Dept. AM-4.

SPIRABANDS

Fit expanding rubber drums for deburring and finishing exterior and interior metal with portable sanding tools. Strong, double-thick cloth backing available in METALITE®, ADALOX®, DU-RITE®, and GARNET, in complete range of diameters and grits.



NEW YOKE SANDER

For belt finishing and polishing small contours and difficult radiusing that formerly required set-up bobs or wheels. This sander is extremely versatile and efficient and can be used vertically or horizontally as illustrated.

BEHR-MANNING

NORTON abrasives

BEHR-MANNING

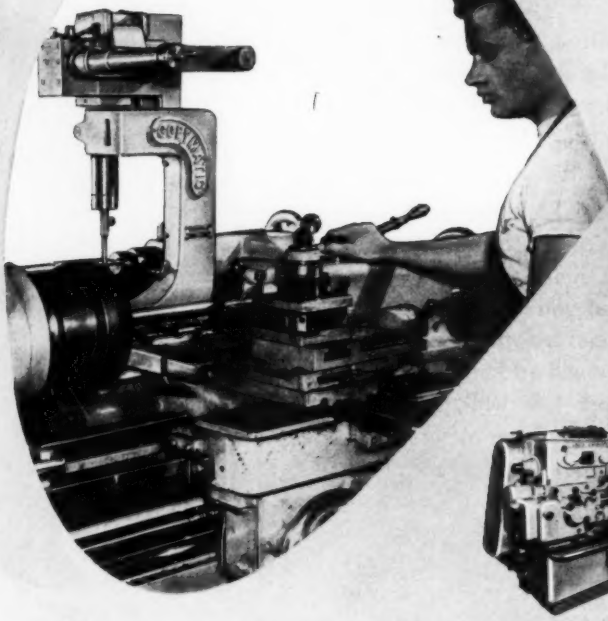
TROY, N.Y.

EXPORT: BEHR-MANNING OVERSEAS INC., NEW ROCHELLE, N. Y., U. S. A.

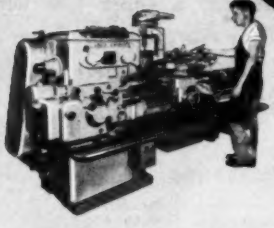
"300% Production Increase"

"Versatile Above All Others"

. . . reports LELAND ELECTRIC CANADA, LTD.
Motor Manufacturers
Guelph, Ontario, Canada



It pays to expand with Lodge & Shipley Lathes!



Production-rated *by users*, Lodge & Shipley COPYMATIC lathes show significant production increases and savings on every application. If you require new lathes for expanded production, consider that one Copymatic will do the work of several conventional lathes. You'll save valuable floor space and manpower—still achieve higher productivity with fewer lathes.

For example, in the illustration, the diameters on a C-1138 steel motor shaft are being turned automatically by the COPYMATIC Lathe. Carbide tools are being used with .0085 feed at 300 S.F.P.M. RESULTS: "300% more production" than by former methods! You, too, can obtain similar production increase with the Copymatic.

Let a Lodge & Shipley Representative show you how the COPYMATIC gives the *versatility* of the engine lathe, *productive capacity* of automatic duplication (with instant changeover) *without* the limited use and high cost of a special purpose machine. Write today for Bulletin 675.

THE **Lodge & Shipley** COMPANY
MACHINE TOOL DIVISION • 3055 COLERAIN
CHOREMASTER DIVISION • 800 EVANS ST.
CINCINNATI 25, OHIO

LINK-BELT Ball and Roller Bearings smooth the path of power

Jack screw holes are provided for easy removal of housing cap.
Self-aligning—inner raceway is truly spherical, free to move in any direction without altering contact area with rollers. Full load capacity always assured with shaft deflection or misalignment.
Large reservoir prolongs lubrication intervals.
Sturdy, two-piece cast housing facilitates installation, inspection and disassembly.
Tapered adapter sleeve provides positive, concentric mounting on commercial shafting.
Easily installed by removing housing cap, slipping adapter assembly onto shaft and locking in position.
Seals effectively keep oil or grease in, dirt out.
The "housing sealed" feature fully protects and lubricates all moving surfaces.
Slotted bolt holes facilitate mounting on supporting structure.
CUTAWAY OF SERIES 6800-6900 TWO-PIECE ROLLER BEARING PILLOW BLOCK.

By any standard . . . **LINK-BELT ball and roller two-piece housing facilitates mounting assembly**

Mounting Link-Belt two-piece housing pillow blocks to your assembly is a quick, easy job. The dowel pin holes are tapped so that a standard threaded bolt can serve as a jack screw to raise the cap for installation. Then just slip the adapter assembly onto the shaft and lock securely into position. There are many other Link-Belt design advantages.

Our bearing specialist near you will show you how to apply them efficiently to your application. And you'll find complete engineering information in Data Book 2550.

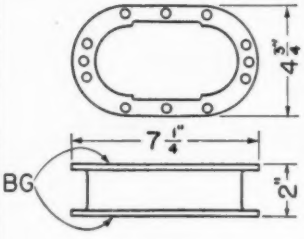
LINK-BELT

Ball and Roller Bearings

LINK-BELT COMPANY: Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12,264

BLANCHARD *is BEST...*

for roughing and finishing parts such as these



Pump bodies are typical of a wide variety of jobs requiring one operation to remove stock from the rough casting, then a finishing operation for extreme flatness and close size tolerances.

For heavy roughing, use the Blanchard No. 18. **On this job, 22 pump bodies are rough ground in one chuck load. .100″ is removed per side.**

For accurate finishing, use the Blanchard No. 18. **16 pump bodies are finished in one chuck load to a tolerance of ± .0003″ and flat to .0003″ to assure a tight joint.**

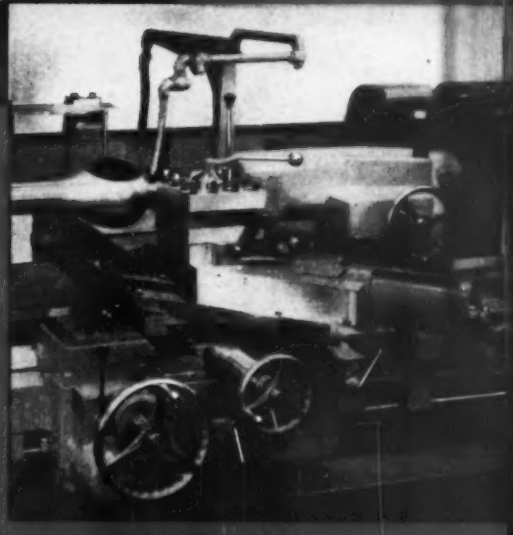
For fast heavy roughing or accurate finishing, use the Blanchard No. 18. **These parts are produced at the rate of 38 pieces (76 surfaces) per hour.**

Send for your free copies of "Work Done on the Blanchard," third edition, and "Art of Blanchard Surface Grinding."

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY **64 STATE ST., CAMBRIDGE 39, MASS., U.S.A.**

2 hrs. versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

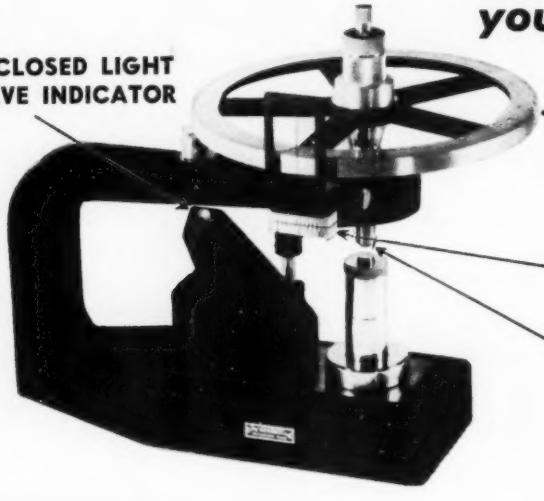
Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

THE NEW *Van Keuren* 0 to 3" LIGHT WAVE MICROMETER

will improve your product . . .



CATALOG AND HANDBOOK No. 34

This 208-page volume represents 2 years research sponsored by the Van Keuren Co.

It presents for the first time in history a simple and exact method of measuring screws and worms with wires.

It tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods.

Copies free upon request.

THE Van Keuren Light Wave Micrometer is an instrument of exceptional merit, proven over a period of 15 years. It has enabled hundreds of High School boys and girls to produce and inspect parts to "Hundred Thousandths" of an inch.

The New 0 to 3" Light Wave Micrometer has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non parallax, vernier index which enables readings to be made to .00001". It has an index lock. It has carboloy tipped anvil and spindle. It is a sturdy, yet sensitive instrument which weighs 17 pounds. It is a portable measuring machine, built for "Sustained Accuracy."

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision—fast, accurate and profitable.

THE *Van Keuren* CO., 173 WALTHAM STREET, WATERTOWN, MASS.

32nd YEAR

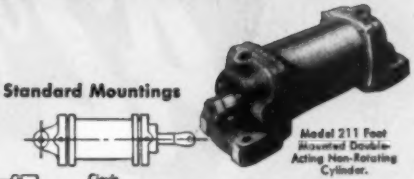
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires

RIVETT Furnishes—

a Complete Power Package

Rivett can furnish the correct valve and cylinder for any hydraulic circuit. There are nearly 300 primary models in the standard Rivett line, each available in a variety of sizes and types. Because of the simplicity of Rivett design, variations can be made to meet any unique situation.

Seven Standard Mountings



Model 211 Foot Mounted Double-Acting Non-Rotating Cylinder.

Clevis

Rabbet

Center-Line

Foot

Blind End Flange

Trunnion

Rod End Flange

CYLINDERS

Offered in pressure ranges of 300 P.S.I. maximum, and 1500 P.S.I. maximum oil services. 3000 P.S.I. maximum service and higher pressure ranges furnished on application. Available in ten bore diameters, in strokes up to 96", with standard and 2:1 differential over-size rod; and with cushioning rod end, blind end or both. Special models supplied.

Model 8832 Sequence Valve

Model 8630 Cam Operated Flow Control Valve

Model 7200-1 Oil Pilot Operated Valve

Model 5605 Solenoid Pilot Operated Four-Way Valve

VALVES

Designed for oil service pressures up to 1500 P.S.I., and furnished for 3000 P.S.I. in certain models. Available in standard, spring-return, spring-centered, and ball detent action; five piston designs: hand, foot, cam, solenoid, oil pressure, and air pressure operated; 1/4", 3/8", 1/2", 3/4", 1", 1-1/4" and 1-1/2" sizes.

Model 5805 Oil Pressure Operated Four-Way Valve

POWER UNITS

Series 9100 single pump, in 5 tank sizes. Capacities, .4 G.P.M. to 40 G.P.M. at 1000 P.S.I. Series 9200 double pumps in 5 tank sizes. Delivery combinations, 3 G.P.M. and .4 G.P.M. to 40 G.P.M. and 12 G.P.M. at 1000 P.S.I.

Model 5905 Air Pressure Operated Four-Way Valve

Send for Rivett Catalog Sections 104 and 202

Model 5310 Cam Operated Four-Way Valve

Model 5100 Hand Operated Four-Way Valve

Model 5500 Double Solenoid Operated Four-Way Valve

RIVETT DEALERS EXPERIENCED IN HYDRAULIC APPLICATION

Newark & New York—Compressed Air Products, 1977 Springfield Ave., Maplewood, N. J., 400 Third Ave., Brooklyn, N. Y.
Philadelphia, Pa.—The Battersby Co., 3701 N. Broad St.
Boston, Mass.—L. W. Sheehy, 1104 Park Sq. Bldg.
Baltimore, Md.—Cauliflower Equip. Co., 516 No. Loudon
Pittsburgh, Pa.—F. R. Magill Co., 44 McKnight St.
Cleveland, Ohio—Garco Machy. Co., 7702 Carnegie
Detroit, Mich.—Fors Sales Co., 2832 E. Grand Blvd.
Flint, Mich.—Shively Sales Company, 719 E. 2nd Ave.
Chicago and Milwaukee—MacMillin Engineering Corp., 6806 North Clark St., Chicago 26, Ill.
St. Louis, Mo.—William Scheer Co., 6376 Clayton Rd.
Dayton, Ohio—Seifreat-Elstad Machy., P.O. Box 322
Cincinnati, Ohio—Seifreat-Elstad Machy., P.O. Box 344
Columbus, Ohio—Seifreat-Elstad Machy., P.O. Box 922
Columbus, Ga.—Bunn H. Martin, P. O. Box 350
Minneapolis, Minn.—Anderson Machine Tool Co., 2641 University Ave., St. Paul 4, Minnesota
Denver, Col.—Iver J. Esbenson Co., 1249 Calif. St.
Los Angeles, Calif.—Haskel Engineering & Supply Co., 721 West Broadway, Glendale, California
San Francisco, Calif.—Ditzen Engineering and Sales, 600 16th St., Oakland 12, Calif.
Portland, Oregon—Hydraulic Power Equipment Co., 2316 N. W. Savier St.
Seattle, Wash.—Pump Engineering Co., 1331 3rd Ave. Bldg.
Canada—Duncan Machinery Co., Ltd., 1922 Wyandotte St. East, Windsor, Ontario; 371 Bay St., Toronto

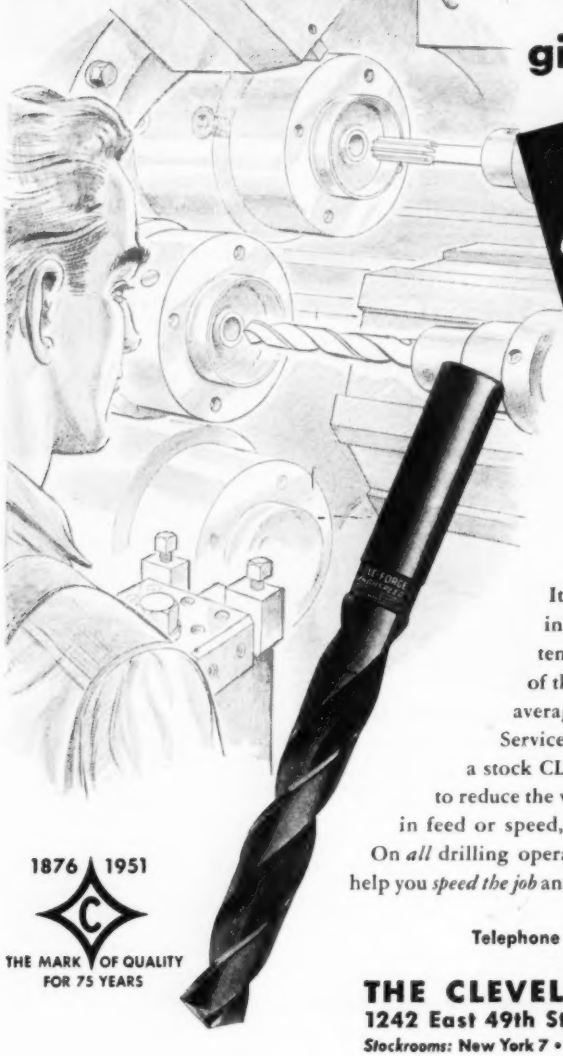
Dept. AM4, RIVETT LATHE & GRINDER, Inc., Brighton 35, Boston, Massachusetts

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with*

RIVETT

Air and Hydraulic Valves and Cylinders, Hydraulic Power Units.

test proves that *Better Wearing Qualities* give you 42%



MORE HOLES PER GRIND

It was a smooth-running job—drilling 1 9/32" holes in a cast iron cover, ½" thick—but the superintendent wasn't satisfied with the wearing qualities of the high speed drills that were being used. They averaged 2705 holes per grind. ◇ When a *Cleveland* Service Representative was called in, he recommended a stock CLE-FORGE High Speed Drill that is engineered to reduce the wear caused by abrasive action. With no change in feed or speed, this drill averaged *3862* holes per grind! ◇ On *all* drilling operations, a *Cleveland* Service Representative can help you *speed the job* and *cut costs.* Contact our nearest Stockroom, or . . .

1876 1951

THE MARK OF QUALITY FOR 75 YEARS

Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street Cleveland 14, Ohio
***Stockrooms:* New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5**
Los Angeles 58 • London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER *Cleveland* TOOLS

*What's in Vermont this month?**

A REVOLUTION IN PRODUCTION QUALITY — AGAIN?

The first revolution in production came during the Civil War when a gunsmith found that machines can produce to close dimensions at a comparatively high rate. He demonstrated interchangeability of parts on what was considered to be a "handmade product."

Machine tool builders improved their product first to do finer work and then to do that finer work at a high production rate. Each improvement brought new products out of the handmade class into the mass production group.

During the last war countless products were mass produced on machines working to tenths. Designers took advantage of the new machines which could produce very accurate work and meet production schedules.

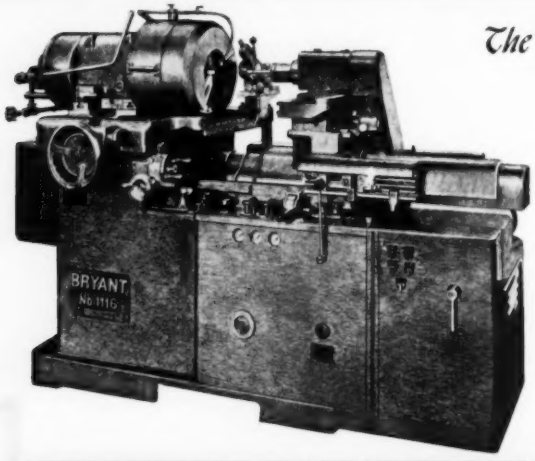
The Bryant Chucking Grinder Company of Springfield, Vermont, has built internal grinders capable of grinding holes to 10 millionths of an inch on diameter and to a surface finish of one half of one microinch. It is generally felt that such close work and such fine surface finish are beyond the needs of any present production requirements. But, should history repeat itself, these tolerances may be required from the machines of tomorrow.

Bryant Chucking Grinder Company is prepared to give you accurate figures on production rates and costs. Send your present production figures to Bryant now. We will give you data which may help you get that new machine.

* Remember . . . it won't cost to inquire!

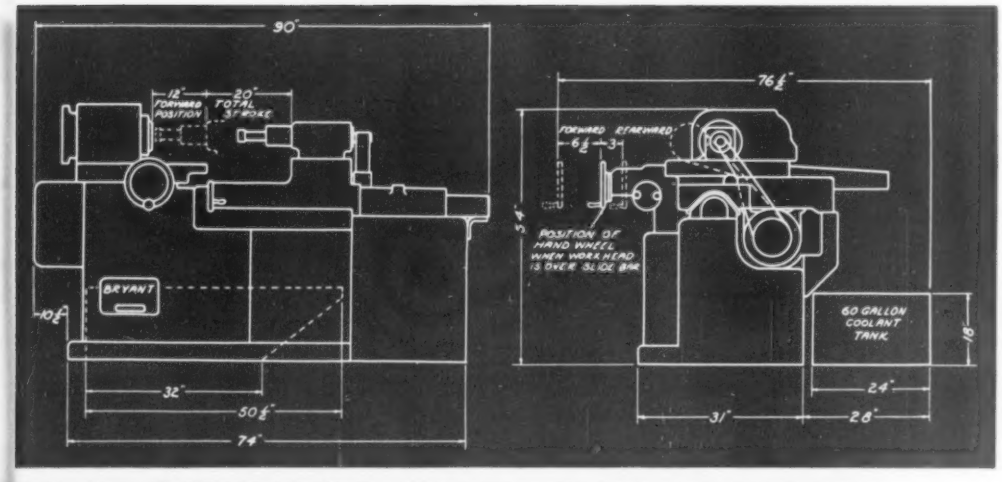
Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.

FOR HOLE GRINDING

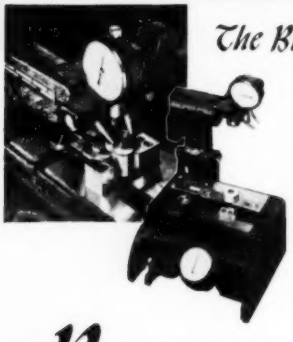


The Bryant 1116 Hydraulic Hole Grinder

This machine is for general purpose hole grinding. It has convenient centralized controls and all features necessary to handle a variety of work with minimum time and effort needed for changing jobs. For stable 3-point support, the wheel spindle is mounted on a cylindrical bar which is supported on 2 cylindrical bearings. The rear of the slide is supported on a hardened and ground guide plate. Workhead may be swiveled for grinding tapers up to 90° included angle. Provision is made for mounting a face grinding spindle in addition to the hole grinding spindle. The No. 1116 will swing 16″ with 8″ max. hole depth. Write for folder.



FACE SQUARE WITH INTERNAL THREAD

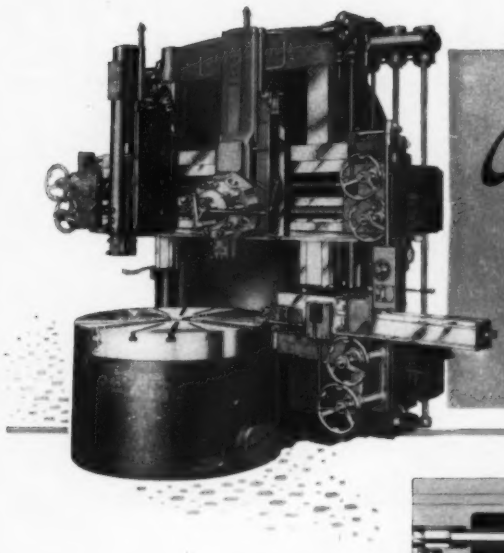


The Bryant Thread Gage with Squareness-of-Face Attachment

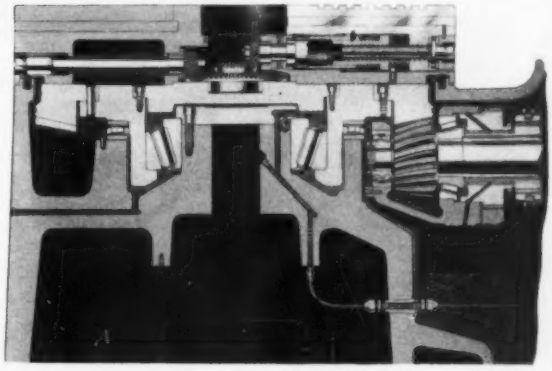
When a face must be checked square with an internal thread, the part should be held on the thread flank and rotated in this position. The Bryant Gage does this, regardless of variation in roundness, P.D., lead or thread form. The squareness-of-face indicator is raised by a yoke at a constant rate regardless of face run-out, thus giving a direct and exact reading of squareness with the thread axis. Simultaneous readings can be made — the Bryant Gage checks thread size — the Attachment shows face run-out.

Bryant Thread Gage gives accumulated reading of P.D., form and lead on dial indicator 4 to 5 times faster than plug gaging!

Bryant Chucking Grinder Company in Springfield, Vermont, U.S.A.



Refinement in DESIGN



All 6 sizes of Cut Master and Man-Au-Trol Vertical Turret Lathes have this Table Carrier.

NO MORE EXPENSIVE FOUNDATIONS
Simplicity of Installation. Just a good firm floor—NO PITS—even for the larger sizes 54", 64" and 74" machines.

VERSATILITY OF RELOCATING
Pick up the machine and place it in the new location. No special foundation required.

SIMPLICITY AND MINIMUM COST OF MAINTENANCE
No need for lifting machine for bearing maintenance.

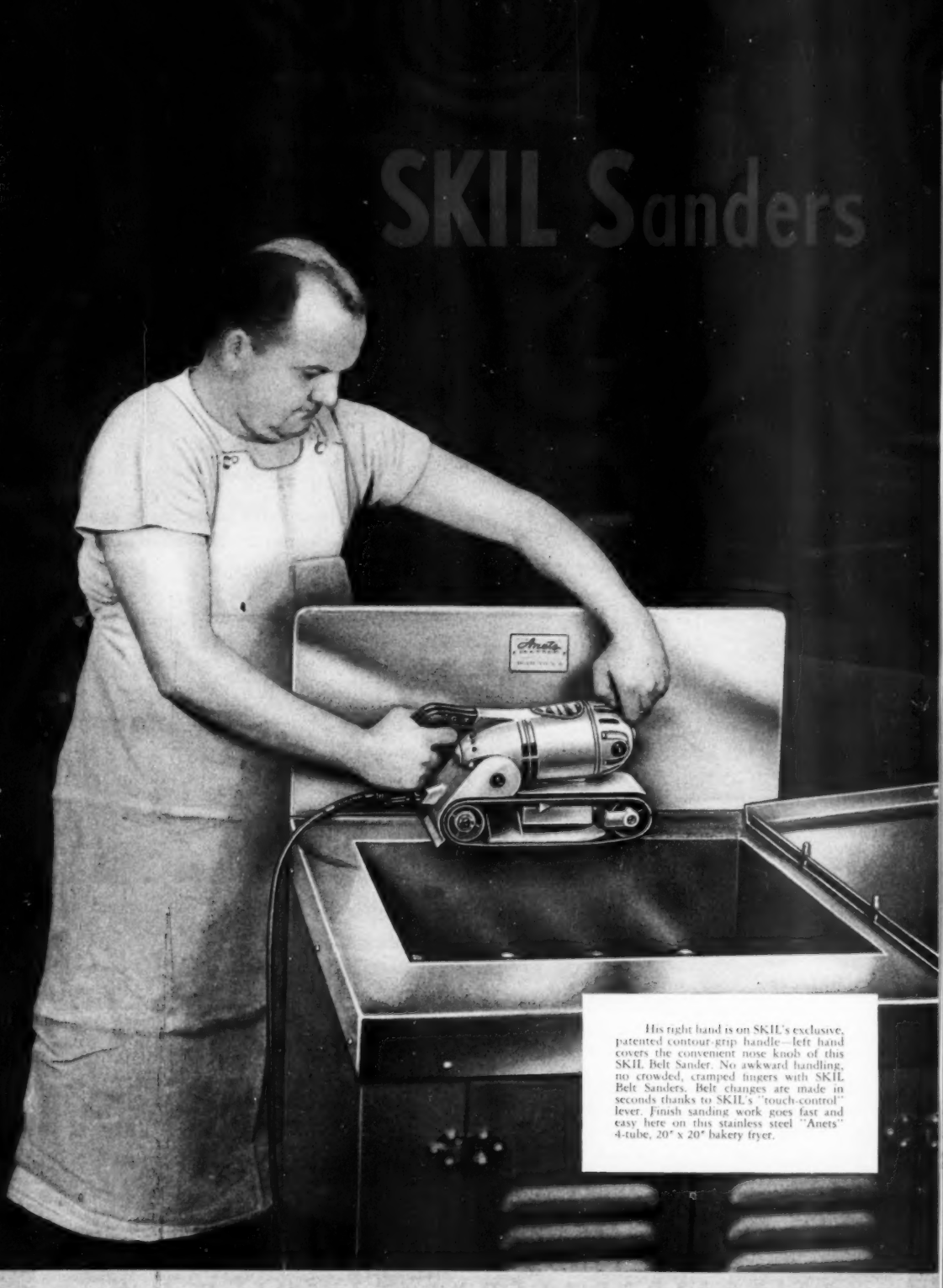
MINIMUM TABLE DEFLECTION
Under extremely heavy loads,—both work and cutting—deflection is reduced to a minimum. Heavier cuts may be made and improved finish obtained on the work. Ask a Bullard Representative to go over this design with you.

BULLARD

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT, U.S.A.

SKIL Sanders



His right hand is on SKIL's exclusive, patented contour-grip handle—left hand covers the convenient nose knob of this SKIL Belt Sander. No awkward handling, no crowded, cramped fingers with SKIL Belt Sanders. Belt changes are made in seconds thanks to SKIL's "touch-control" lever. Finish sanding work goes fast and easy here on this stainless steel "Anets" 4-tube, 20" x 20" bakery fryer.

SKIL Saws

SKIL Sanders

SKIL Grinders

SKIL Sanders

SKIL Shear

SKIL Drills

SKIL Grinders

produce sparkling finishes

at Anetsberger Brothers, Inc.

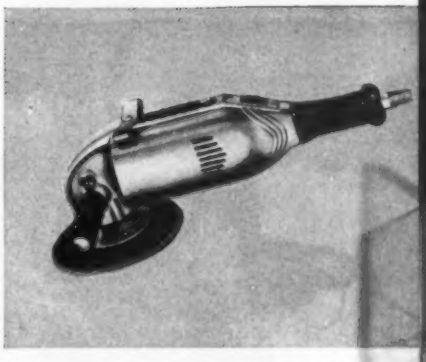
SKIL Disc Sanders and SKIL Belt Sanders help increase sales-appeal of famous "Anets" Bakery and Food Serving Equipment

Look at the smooth, gleaming, ripple-free finish on each stainless steel "Anets" product. Note how these bright, shiny finishes add extra "buy-appeal"—assure effortless cleaning and maintenance. Think how easily, how economically SKIL Sanders can produce similar results in *your* finishing operations on metal, wood or compositions!

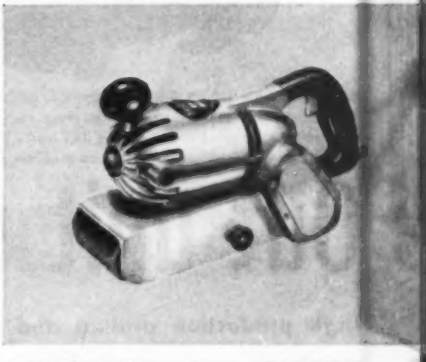
Like many other manufacturers of high quality products, Anetsberger Brothers, Inc., Northbrook, Illinois, have found SKIL Portable Tools fast, efficient, dependable. SKIL Belt and Disc Sanders, SKIL Drills, SKIL Screwdrivers and SKIL Saws *all* play an important part in production line and maintenance work in the large Anetsberger Brothers plant.

Ask your SKIL Tool Distributor to demonstrate SKIL Sanders and other famous SKIL Tools today!

SKIL Products are made only by
SKILSAW, INC.
5033 Elston Ave., Chicago 30, Ill.
Factory Branches in Principal Cities
In Canada: SKILTOOLS, LTD., 66 Portland St., Toronto, Ont.



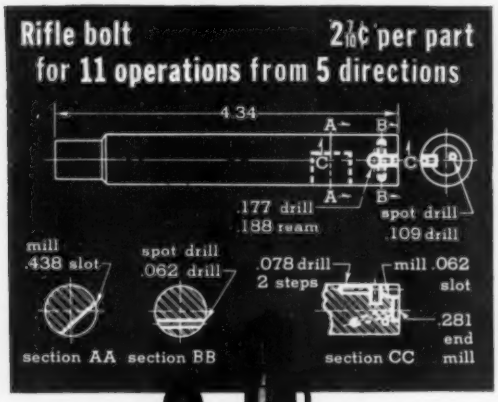
SKIL Disc Sanders—6 powerful models



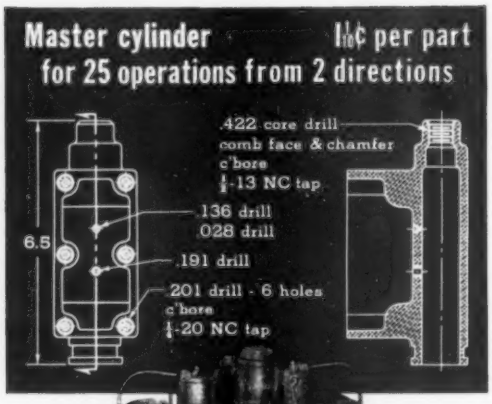
SKIL Belt Sanders—4 powerful models

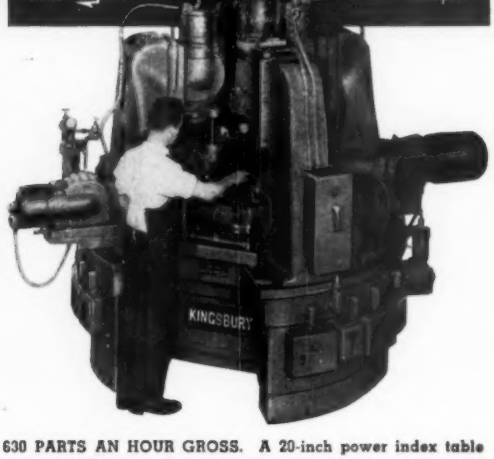
This "Anets" 14-inch restaurant fryer gets a fast, thorough polishing with a powerful SKIL Disc Sander. The wire brush takes good care of the "hard-to-reach" spots. SKIL Disc Sanders can easily solve *your* sanding, cleaning and polishing problems—*try one on your production line for proof!*

SKIL
PORTABLE TOOLS



330 PARTS AN HOUR GROSS. On this 40-inch "Auto-Index" a vertical unit mills the .438 slot; four units on the central column and inverted at 45° do the .062 and .188 holes; six units on the base do four axial operations and the .109 angular hole.





630 PARTS AN HOUR GROSS. A 20-inch power index table has eight fixtures. Four vertical units operate on the axial hole. Six horizontal units, three with 6-spindle auxiliary heads, operate on the other holes. The .028 drill runs at 14,000 rpm.

Cut unit costs with many

High production drilling and tapping machines, either simple or complex, combine operations to save money

Dear Sir:

These high production machines save money. The pay-off period is one to three years, or even less.

Each machine here replaces several general-purpose machines. One man loads and unloads each one. Automatic drilling and tapping units of 1/3 to 5 hp do the operations. That means a big saving in direct labor, some saving in handling and space.

Scrap is less, since each machine produces uniform, accurate parts. Automatic work cycles never vary. Fixtures and index tables are jig-bored to such close limits that parts from all fixtures are exactly alike. Bushings locate drills and reamers to close tolerances.

Savings not always obvious

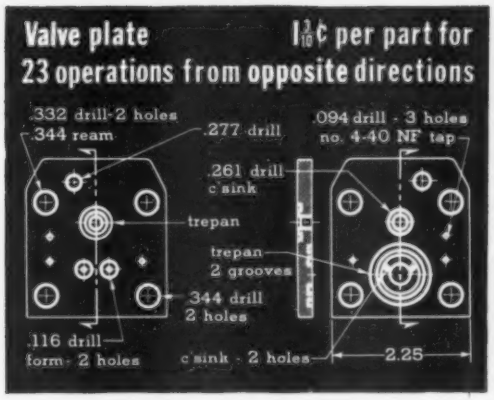
"A new Kingsbury," says an article in *American Machinist*, "drills, reams and countersinks both ends of a small roller, has cut time to only 0.18 min. per piece. Even though there is only enough work to operate it about a week a month, it has already paid out in labor and scrap savings."

Firms have ordered Kingsburys when they needed only 25 or 30 parts an hour. You might think those machines would be a poor investment. But in each case someone figured out that there would be a good saving.

Not on old envelopes now

It used to be that you could take a proposal and figure the savings on any handy piece of paper. Nowadays many people use a work sheet of some kind. For one thing, it is easier for others to follow the figuring.

There is a good work sheet in the National Machine Tool Builders' booklet, *Computing Return on Invested Capital*. They describe the method fully. If you want a book-



500 PARTS AN HOUR GROSS. Each part passes twice around this machine. A 20-inch index table has eight double fixtures, each holding one part on each pass. Seven multi-spindle units do all 23 operations. Bushings guide all tools but the taps.

830 PARTS AN HOUR GROSS. Drop a part in the fixture and trip a lever. The fixture locates and clamps. Five 2-spindle units operate. The fixture unclamps and ejects. Time: 3½ secs. The operator can adjust the units to operate on similar linings.

operations per chucking

let free, ask us on your business letterhead.

Unit costs on the drawings

Not to be outdone, this is how *we* figured each unit cost above. It includes only the cost of the man and of the machine. We assumed:

Unit cost of the man equal to:

$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross x 80\% efficiency}}$$

Unit cost of the machine equal to:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hours @ 80\% efficiency}}$$

You may not like our assumptions on efficiency, wage rate or 6000 hours. But at least the method is sound. We had to assume things, but you can use *actual* figures. You get a realistic result, whether or not your machine runs full time.

Instead of an average hourly wage you can use your actual wage (with or without hourly fringe benefits). Instead of output in 6000 hours, you can use your output in either your pay-off or "useful life" period.

You can complete the picture by comparing that cost with your unit cost now and estimating savings in overhead. That was beyond us here.

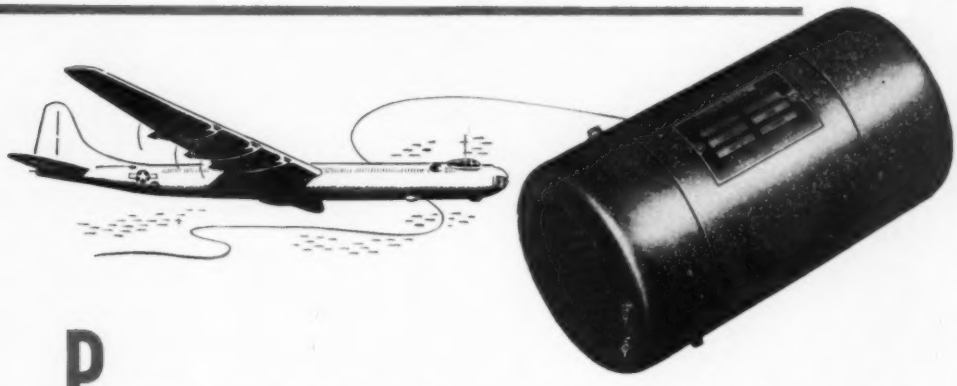
Don't get us wrong. Savings are often so obvious you need not figure them on paper. But you can't judge savings without proposals. If you want us to quote, send a print to our Mr. L. A. Carll and tell him the operations and output you need. Free bulletins show what we can do.

Sincerely,
Kingsbury Machine Tool Corp.
140 Laurel Street, Keene, N. H.

KINGSBURY
AUTOMATIC DRILLING & TAPPING MACHINES
for Low-Cost High Production

Armature commutators of varying types are turned 55% faster since Red Bank Division of Bendix Aviation Corp. installed this new LeBlond 13" Rapid Production Lathe. Spindle speed, 1800 r.p.m. Feed, .004". Tool, diamond. Material, copper. Tolerances—concentricity, .0005"; dia., .002". Setup changes, four-five per shift.

for an airplane's eyes and ears



Power for vital radar and communications equipment in airplanes is supplied by dynamotors like this. They're made in dozens of types and sizes to provide precise, unfailing power for the variety of electronic accessories used in modern aircraft.

Heart of the dynamotor is the armature. Its commutators require turning to high degrees of finish and accuracy for dependability under all flight conditions. For this job Red Bank Division of Bendix Aviation Corp. needed a precision production lathe, versatile enough to handle the entire range of sizes without costly setups. They installed a new LeBlond 13" Rapid Production Lathe . . . recommended by the LeBlond New York Office. Result? *Production increased 55%.*

This LeBlond Lathe makes possible high-production turning of a *variety* of work within the range *you* choose. It offers your choice of two geared and one motor headstock with various speed combinations from 68 to 3600 r.p.m., feeds from .001" to .064". A score of attachments is available.

Whether you turn tiny armatures or ten-ton shafts, there's a LeBlond Lathe to turn them faster, better. Your nearby LeBlond Distributor will tell you about the 13" Rapid Production and other late models. Call him or write . . .

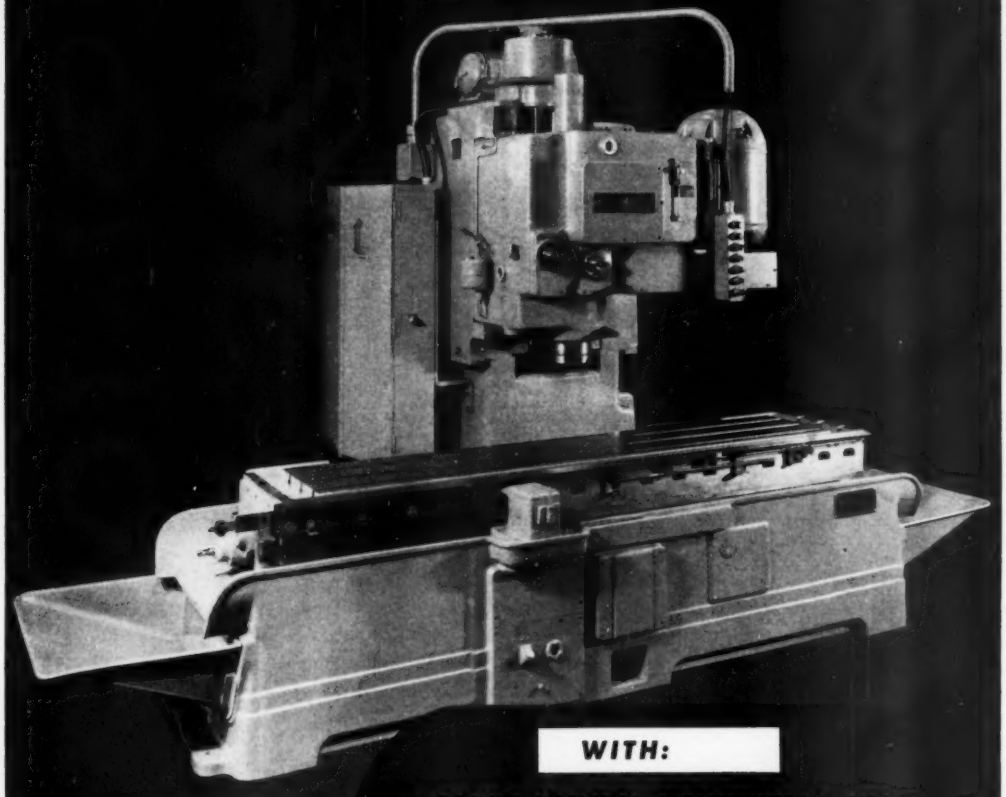
THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

Ask for Bulletin RP-201 A for more information on the 13" Rapid Production Lathe.

turned faster by LeBLOND *of Cincinnati*

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • FOR MORE THAN 63 YEARS

NEW! SUNDSTRAND VERTICAL HEAD RIGIDMIL



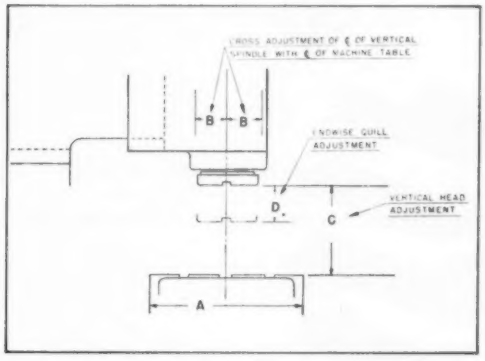
WITH:

- POWER VERTICAL MOVEMENT TO HEAD
- AUTOMATIC TABLE CYCLES
- POWER POSITIONING TO HEAD CARRIER
- AUTOMATIC CUTTER RELIEF

SUNDSTRAND

RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT

This new vertical spindle arrangement is available with the Sundstrand Models 22 and 33 Rigidmils — up to 25 horsepower heads. The machine has power vertical adjustment to spindle head, endwise quill adjustment and cross adjustment to the spindle head carrier. It is easily and quickly adjusted to handle a wide range of work and to simplify set-ups.



Machine	A	B	C Min.	C Max.	D
Model 22	12″	3″	6″	14″	2-1/2″
Model 33	18″	4″	6″	18″	5-1/2″

Schematic drawing of endview and chart showing capacity of new Sundstrand Rigidmil.

Power Movement To Head

The vertical head is mounted on vertical ways and provided with power vertical movement. This feature makes it possible to clear bosses or obstructions quickly while milling. The range of power adjustment for the Model 33 Rigidmil is from 18″ max. to 6″ min. between spindle nose and top of machine table.

FREE DATA

It may pay you to keep abreast of current developments in Sundstrand machine designs. Write for descriptive literature of these new models. Ask for bulletin 106.

Automatic Table Cycles

Table cycles for these Sundstrand Rigidmils are automatically controlled by dogs mounted on the front of the machine table. The dogs are easily adjusted and proper set-ups for production milling operations can be made quickly. A wide variety of table cycles are available and feed rates range from 1/2 to 50 or 1 to 100 inches per minute. The rapid traverse rate is 300 inches per minute.

Power Positioning To Head Carrier

The vertical head is mounted on an adjustable carrier which provides the vertical spindle with four inches of cross movement either side of the center line of the machine table. This cross adjustment is made easily and quickly by power. All movements are controlled by push button.

Automatic Cutter Relief

At the completion of the cut, the spindle head automatically retracts for cutter clearance on the return stroke and is automatically re-set at the end of the return stroke for the start of a new cycle.

The machine can be hand controlled by push buttons for single job set-ups or automatically by table dogs for production milling.

SUNDSTRAND

SUNDSTRAND

Machine Tool Company

2533 Eleventh St. Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

ARMSTRONG

ARMSTRONG TOOL HOLDERS

answer both . . .

1. **The problem of lowering costs**
2. **The problem of increasing output**

By providing permanent, multi-purpose, inexpensive ARMSTRONG TOOL HOLDERS that use cutters or bits that are quickly ground from standard high speed shapes (Saving: All Forging, 70% Grinding and 90% High Speed Steel), the Armstrong System of Tool Holders will reduce your tool cost to an absolute minimum.

By providing stronger, more efficient tools, carefully developed for each operation, as well as ARMSTRONG High Speed Steel, ARMALOY Cast Alloy Cutter Bits or Armide Carbide-Tipped Cutters as required for each job, ARMSTRONG TOOL HOLDERS permit greatly increased speeds and feeds, enable you to increase the hourly output of every lathe, planer, slotter, shaper, turret lathe and screw machine.

There is no surer way to lower costs and increase output, than to use the correct ARMSTRONG TOOL HOLDER for each operation on all machines.

Stocked by Leading Tool Departments

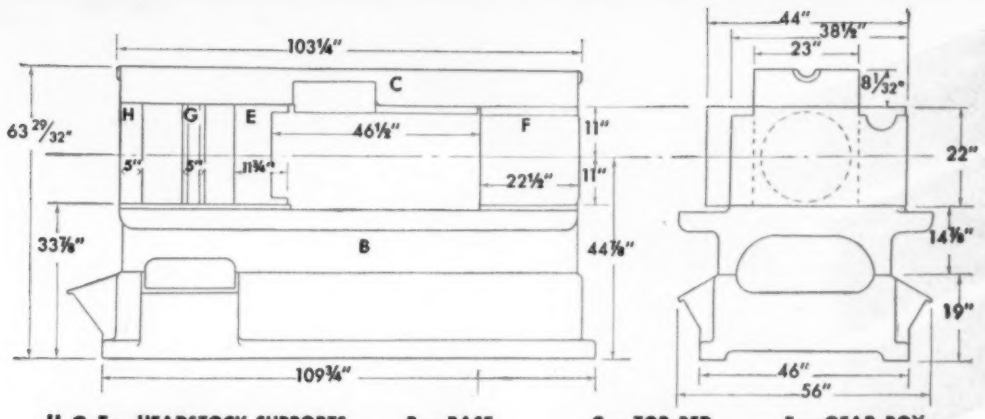
ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. Armstrong Ave. Chicago 30, U.S.A.

New York and San Francisco

Write for New S-48 Catalog just released.



H, G, E — HEADSTOCK SUPPORTS Weight — 1233 lbs. | **B — BASE** Weight — 6655 lbs. | **C — TOP BED** Weight — 1232 lbs. | **F — GEAR BOX** Weight — 841 lbs.

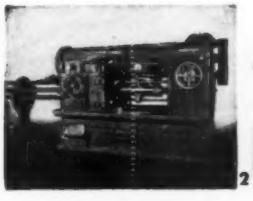
BE VALUE WISE OR OTHERWISE

True of any "means goods," the purchase price of any Multiple Spindle Bar Automatic is only relative. It is "high" or "low" on the basis of the total cost of its total services, compared to other brands. Important items of total cost are those of operation and maintenance.

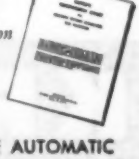
Machine analysis will invariably disclose the low cost operation and maintenance features that have been "built into" a machine. Such features are built into the CONOMATIC, beginning with its very foundation. The figures above substantiate the claims below.

THE 1½" Six Spindle MACHINE FRAME:

1. **Provides greater capacity for handling work.**
   The Frame provides a LONGER TOOLING AREA, with more positions and accommodations for tooling and attachment applications, with more clearance and conveniences for faster tool setting, than are provided by any other "automatic."
2. **Provides better support to work and tools.**
   The Frame provides better support and alignment to headstock members, tool slides, and other units and mechanisms, with BASE SUPPORT CLOSER TO THE WORK AXIS, with BETTER TOP BED SUPPORT TO SHORTER, "WEAVE PROOF," UPRIGHTS, and, with larger, heavier, and stronger, Top Bed and Base, than are provided by any other "automatic."
3. **Provides greater accessibility for lower cost operation and maintenance.**
   The Frame provides a more orderly arrangement of, and easier access to, all units, mechanisms, parts, and adjustments, than can possibly be provided by any "automatic" that does not have a VISIBLY ACCESSIBLE, NON-INTERFERING CAM SYSTEM.



Buyer's Comparison Chart will guide you to full information



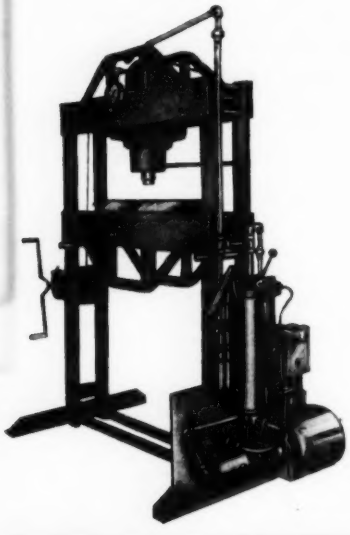
A Comparison of ALL Automatics is in Favor of Cone

2 Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

Biggest Name in Vacuum Bottles

USES K·R·WILSON PRESS



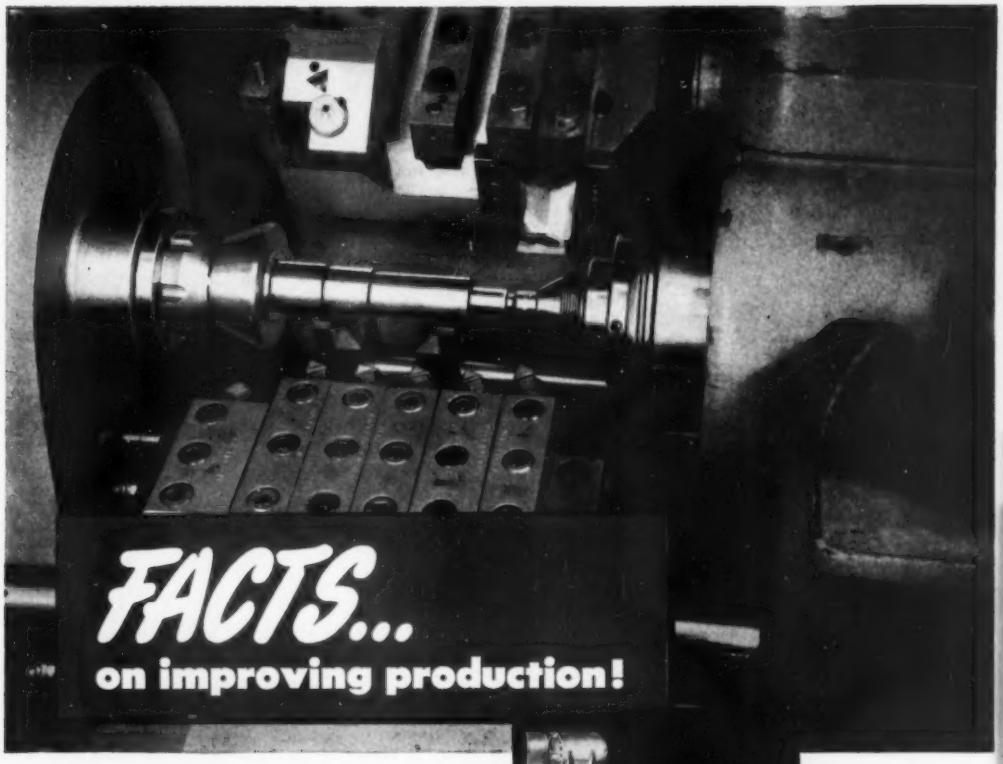
No doubt about it! The "Thermos" bottle is as familiar to the American scene as the illustrious hot dog. And our good customer, American Thermos Bottle Co., uses a K. R. Wilson Hydraulic Press in producing thousands of these famous "hot coffee containers" every year.

Tool boxes, skis, gas tanks, glove compartments in cars, even milady's cold cream . . . these and hundreds of other products are processed somewhere along the line on KRW presses. If there's a place in *your* manufacturing operations for Hydraulic Presses, you'll save money and cut production costs with KRW. Available in 25 - 150 ton capacities, K. R. Wilson presses are self contained completely above ground. In many cases, the cost of a KRW press has been less than the foundation cost of heavier mechanical equipment recommended for the same job. One, two and three cylinder models: either hand-operated, air-operated or motor driven; vertical or horizontal ram travel. If you need a specially built press to do a special job, let us know. We'll engineer one to your specifications.

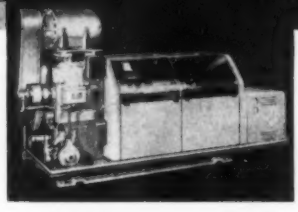
K·R·WILSON

215 Main Street - Buffalo 3, N. Y.

• Ask your machinery dealer to quote you . . . or write or wire Dept. 11 for full facts and prices.



2 Fay Automatic Lathes replace 11 other machines



JONES & LAMSON 16" FAY AUTOMATIC LATHE with automatic sequential control

Newly designed Fay Automatic Lathes, more powerful than ever, turn rear axle drive pinions *at 1185* S.F.M. . . . *Remove approximately 2 pounds of metal from each forging in 8.5 seconds* . . . Cut production costs by *more than a third!*

The forgings are turned complete *in one operation* within close engineering tolerances. The two bearing diameters are held to ± .0025 inch and concentric with ± .0005 inch. All other dimensions are maintained within ± .005 inch.

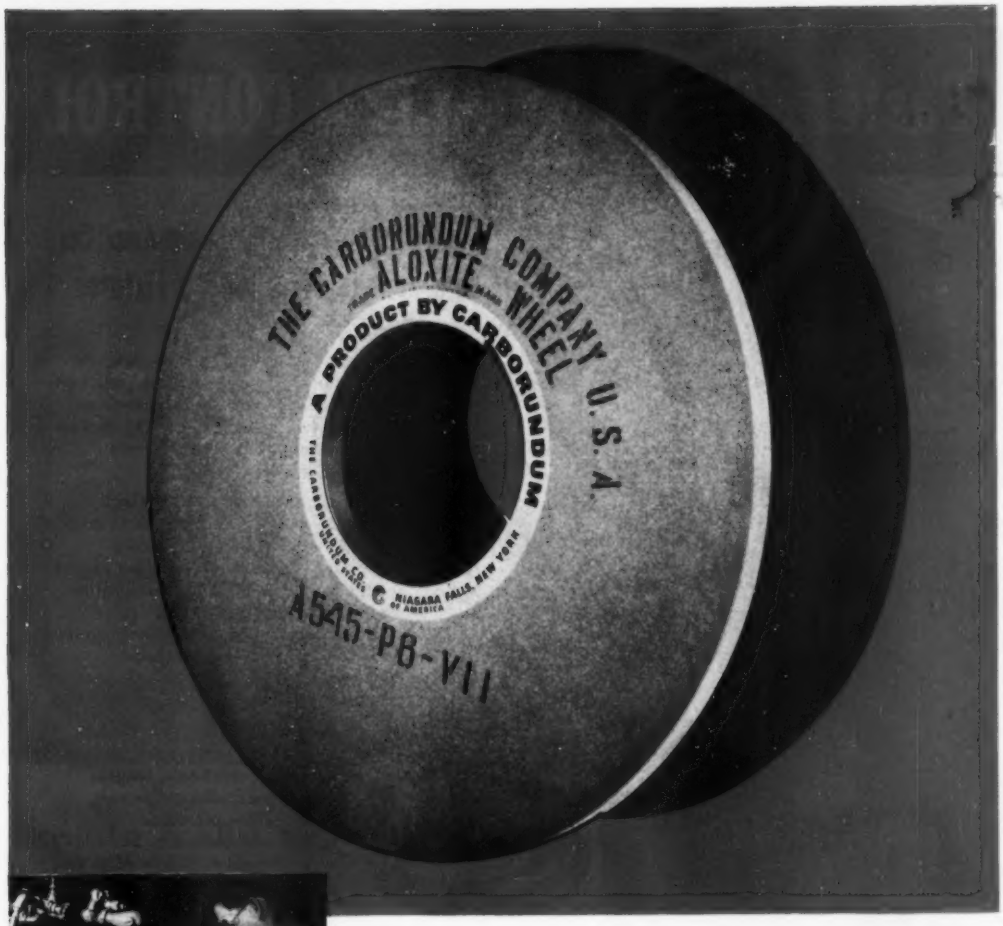
Now, more than ever, the most efficient machines and methods are needed to make the most of your available manpower and material. Jones & Lamson is ready, willing and able to help you with your turning, threading and inspection problems.

Write *today* to Department 710.

Turret Lathes—Fay Automatic Lathes—Thread Grinders—Optical Comparators—Threading Dies

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.
Machine Tool Craftsmen Since 1835

Greater Productivity Plus . . .
. . . increasingly closer tolerances on new products demand better methods. Now is no time to tolerate old machines. Users attribute high production and sustained accuracy to New Britain Precision Boring Machines.
The New Britain-Gridley Machine Division,
The New Britain Machine Company,
New Britain, Conn., U.S.A.
AUTOMATIC BAR AND CHUCKING MACHINES • PRECISION BORING MACHINES
LUCAS HORIZONTAL BORING, DRILLING AND MILLING MACHINES
NEW BRITAIN
Automatics
THE NEW BRITAIN MACHINE COMPANY
NB
NEW BRITAIN



More Crankshafts per Wheel!

These V 11 bond grinding wheels by CARBORUNDUM are setting new higher standards in crankshaft grinding. They provide a high rate of stock removal with minimum heat generation and wheel wear. Exceptional form holding qualities are retained for extended periods; close work tolerances are readily maintained. There is a noticeable reduction in grinding pressures which results in better finish, size and form.

Today actual records in many plants substantiate the value of V 11 bond grinding wheels for increased production efficiency by giving more "cranks" per wheel.

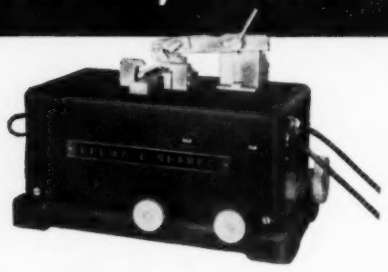
Only CARBORUNDUM

TRADE MARK

makes ALL Abrasive Products... to give you the proper ONE

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, New York.

Faster, Closer QUALITY CONTROL



Special gaging fixture made by Brown & Sharpe for inspecting dimensions, side parallelism, and side squareness of cutter blades. Employs 4 Gage Head Cartridges . . . used with 4 Amplifiers.

Electronic Amplifier No. 950.

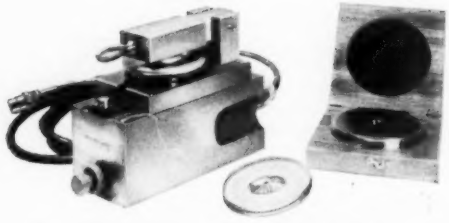
Brown & Sharpe Electronic Amplifiers with built-to-order Gaging Fixtures

Here's an unbeatable set-up for fast, low-cost precision inspection or gaging of many small parts that usually demand high-skilled measurements. Special gaging fixtures, custom-built by Brown & Sharpe, can reduce exacting measurements to a simple, speedy routine.

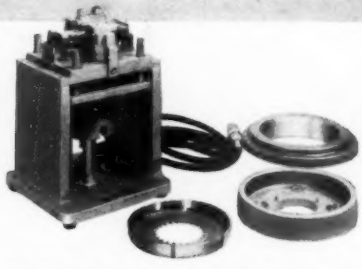
Employing versatile Brown & Sharpe Gage Head Cartridges, these low-cost fixtures in combination with Brown & Sharpe Electronic Amplifiers provide flexibility that enables gaging to be done right at the machine or production line. Work is easily checked by .0001" to .00001", and measurements are visually magnified from 1800 to 18,000 times by the Amplifier . . . permitting operators to read "tenths", or finer, as easily as inches.

Investigate Brown & Sharpe Electronic Gaging Equipment for improving *your* quality control. It can be applied for gaging thickness, length, angle, parallelism, diameter, taper or combinations of several dimensions. For details write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

WE URGE BUYING THROUGH THE DISTRIBUTOR



Special gaging fixture, custom-made by Brown & Sharpe, permits gaging of meter valve plate flatness to .00001", when used with Brown & Sharpe Amplifier.



Custom-made fixture, employing Brown & Sharpe Gage Head Cartridge and one Amplifier, simultaneously measures major and minor I.D.'s of tapered bores and indicates accuracy of internal angle.

Brown & Sharpe B·S

How to make every day a ~~red~~ PINK letter day

SWITCH TO CIMCOOL° and watch the working picture in your metal cutting shop take on a rosy hue. For this radically new and different cutting fluid *covers 85% of all metal cutting operations.*

It'll be a happy day, too, for you and your operators because Cimcool *does a better job!*

Cimcool is superior to old-fashioned coolants because it is a *chemical emulsion.* It replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces down-time and cuts labor costs for cleaning and changing.

We sincerely believe that one week's run will convince you. And we'll be happy to provide a demonstration in one of your own machines. Just write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet "CIMCOOL Gives the Answers." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Company, Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

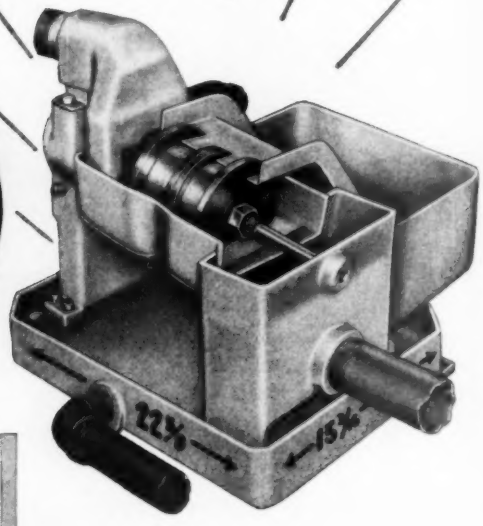
A Production-Proved Product of
THE CINCINNATI MILLING MACHINE CO.

for 85% OF ALL METAL CUTTING JOBS

small compact powerful

amazing new HOUDAILLE magnetic clarifier

for Coolants and Cutting Oils



- **Takes up no more space than a drinking fountain . . . yet**
- **Does a king-sized job! Removes 98% of contamination from coolants and cutting oils!**

New Houdaille Magnetic Clarifier is completely automatic . . . uses no filter bags or cartridges . . . requires no attention. Trouble free! Simple design, rugged mechanism requires no maintenance. Nothing to get out of order.

Ideal for individual machines of all types, such as; grinders, milling machines, gear shapers, drilling machines, etc.

Write for new bulletin describing the compact, powerful new Houdaille Magnetic Clarifier, TODAY!

Coolant Clarification Cuts Rejects, Reduces Downtime

Liquid coolants used for grinding and cutting operations must be kept free from metallic and abrasive contamination . . . otherwise grinding wheels become loaded and cutting tools are quickly dulled. Excessive rejects and machine downtime are the usual penalties imposed by contaminated coolants. Continuous clarification . . . before the coolant flows over the work . . . results in longer tool and wheel life, better finishes, fewer rejects and less downtime. Coolant use is greatly extended and man-hours are saved by eliminating periodic sump cleaning.

Write for Engineering Bulletins and Case Histories on the filtering of coolants and oils used in metal-working operations.

With the addition of the new Houdaille Magnetic Clarifier Honan-Crane now offers a *complete line* of the finest clarification, purification and handling equipment available for metal working oils and coolants. Write for descriptive literature; stating type of problem involved.

Houdaille "T" Type Clarifier
Cartridge type clarifier connects directly to individual machine tool.

Honan-Crane Purifier
For complete purification through use of cellulose fibre and Crasite (fuller's earth).

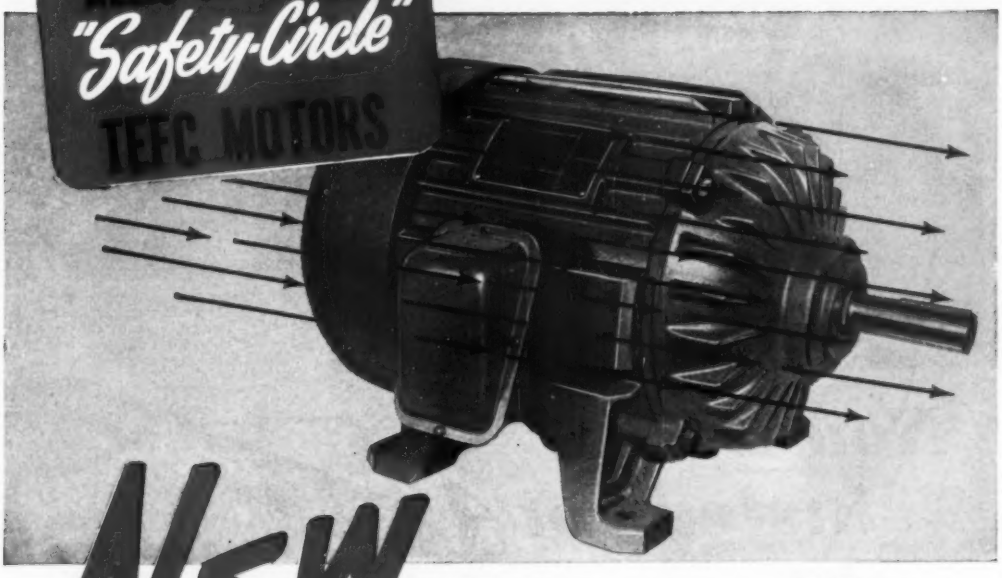
Houdaille Automatic Clarifier
For clarification of oils and coolants in large volume, central systems.

Houdaille Mobile Coolant Filter
Cleans coolant sumps without interrupting production. Easily handled by one man.

Houdaille Sump Cleaner
For sump cleaning and manual transfer of oils to and from clarifier or purifier.

HONAN-CRANE CORP. 325 SUPERIOR AVE., LEBANON, INDIANA

A Subsidiary of **HOUDAILLE-HERSHEY CORPORATION**



NEW Easy to Clean Protected From Dirt

THIS NEW *Safety Circle* totally-enclosed, fan-cooled motor cannot clog with dirt. The ribbed cooling surfaces are outside the motor. There are no pockets or crevices where dirt can collect. Cooling air is not enclosed at any point except the fan cover.

Cleaning is the simplest of maintenance operations done in a few seconds with an air hose. The fan cover also can be removed very quickly for a thorough cleaning.

Factory Lubricated Bearings

Bearings are lubricated at the factory and operate without attention or cost for years. The frame of this *Safety Circle* TEFC motor is cast iron, inherently corrosion resistant, strong and rigid. The extra rigidity of the cast iron frame holds the bearings in true alignment under severe operating conditions. This gives long bearing life and low operating costs.

Get All The Facts

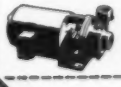
The new *Safety Circle* totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224 to 505. Your Allis-Chalmers Authorized Dealer or Sales Office has complete information. Call today or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144. A-3235

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems

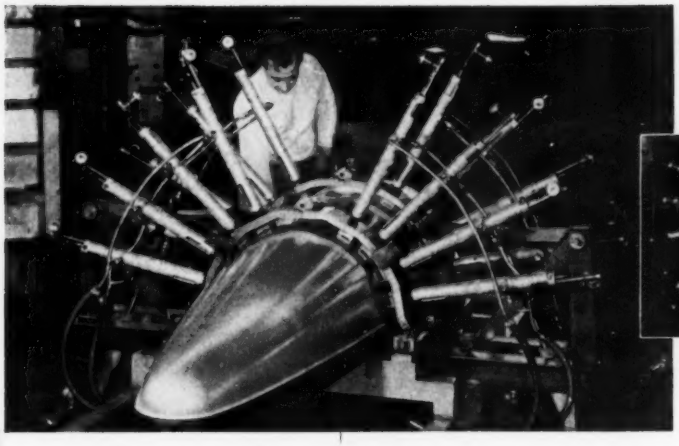
TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



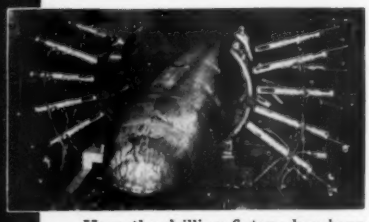
PUMPS — Integral motor and coupled types from ¾ in. to 72 in. discharge and up.

Safety Circle, Texrope and *Vari-Pitch* are Allis-Chalmers trademarks.

ALLIS-CHALMERS



With drills in operating position, the drilling cycle is ready to begin



Here the drilling fixture has been opened (by air cylinders) and the shell removed, showing the template below. Seen from opposite end

Now 1 man instead of 4

to drill these sixteen holes

North American Industries of Chicago manufactures gas tanks—the kind made to be jettisoned from aircraft. In producing them, sixteen accurately-spaced holes must be drilled in 14-gauge (.064) aluminum alloy, for mounting baffles in the teardrop-shaped shell.

Above is shown a fixture with sixteen Keller Airfeedrills* which are now used for this drilling job. All sixteen drills operate simultaneously at the touch of an air valve—advance, drill, retract, and shut off. The entire cycle takes only 23 seconds—about half the time formerly required when four men did the same job with hand-held power drills.

Use of the new drilling setup has so speeded the flow of production at this point that stacking and rehandling the shells is no longer necessary. Elimination of the ragged breakthrough from hand drilling also simplifies deburring.

Perhaps you, too, have an application for Keller Airfeedrills. We will gladly discuss it with you. In the meantime, write for our free booklet —"The Hole Story of the Keller Airfeedrill."

*Keller Tool Company Trade Mark

Features

*of the Keller Airfeedrill**

- Assures accurate holes without costly fixtures . . . can be used with existing jigs
- Attaches in any position and supports itself at any angle
- Operates and is controlled entirely by air . . . with pneumatic cycling to speed production, reduce operator fatigue
- Small size permits it to be used on close centers and in tight places
- Accurately drills parts too large for conventional drilling machinery
- Wide range of speeds and strokes will accommodate light or heavy metal, wood, composition, plastic
- Lightweight portable and stationary models are readily adapted to changing job requirements...quickly shifted from job to job

KELLER *Pneumatic Tools*

KELLER TOOL COMPANY, GRAND HAVEN, MICH.

HARDINGE
ELMIRA, N.Y.

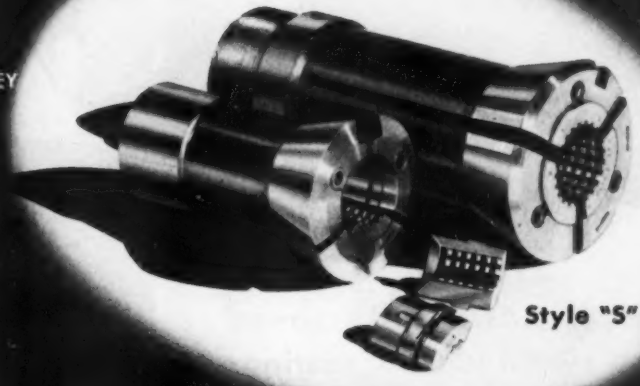
MASTERS AND PADS
for
BETTER PERFORMANCE and BETTER PRODUCTION

HARDINGE STYLE "S" SURE-GRIP DRAW-IN MASTER COLLETS and PADS

for

CLEVELAND
CONE
GREENLEE
GRIDLEY and ACME-GRIDLEY
NATIONAL ACME
NEW BRITAIN

Available for all sizes of above machines up to and including 3½" capacity.



Style "S"

Style "B"

HARDINGE STYLE "B" MASTER FEED FINGERS and PADS

for

BROWN & SHARPE
CLEVELAND
CONE
DAVENPORT
GREENLEE
GRIDLEY and ACME-GRIDLEY
NATIONAL ACME
NEW BRITAIN

Available for all sizes of above machines up to and including 3½" capacity.

Ask for Style "S" and Style "B" Bulletins which give all performance features, price savings, and ordering information.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

This is another of the "HUNDREDS OF JOBS" which can be done on a MARVEL Band Saw!

MARVEL BAND SAW saved these two 4400 lb. castings

Two sand cores washed out when these giant 4400 pound steel connecting rods were cast, resulting in solid eye ends without gaps. Then came the $64 question—how to machine out the 1½" slots in the longitudinal center of the eyes which were 22" high and had a wall thickness of 6½".

The Ernest J. Nelson Iron Works of San Francisco, did this "impossible" job easily, quickly and economically, without special tooling, on a standard Model #8M/2 MARVEL Band Saw. Two cuts were made in each rod in two hours per cut with tool cost of $3.06 per rod. The tool was a MARVEL B9-10 Band Saw Blade.

Every tool room, machine shop and maintenance department needs a MARVEL Series 8 Universal Band Saw—not only for innumerable everyday jobs but for the occasional "trick" operations, where its utmost versatility will save many headaches and dollars.

WRITE FOR CATALOG

MARVEL Metal Cutting SAWS
Better Machines—Better Blades

These exclusive MARVEL Features made this job easy.

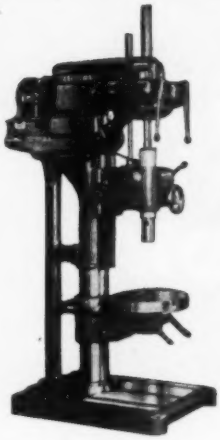
1. Large, T-slotted work table.
2. Blade feeds into work vertically; work always stationary.
3. Power-pressure feed.
4. Automatic Blade tension.
5. Built-in coolant system.
6. Large capacity.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVENUE **CHICAGO 39, ILLINOIS**

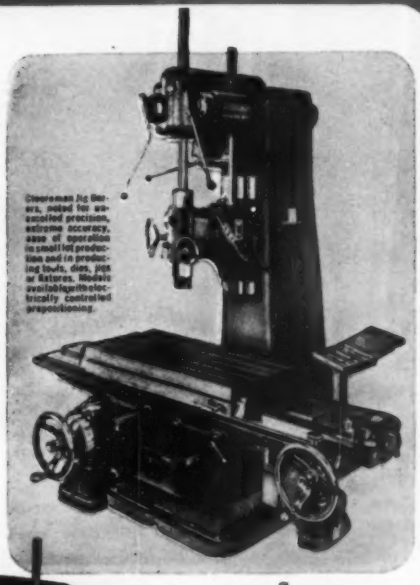
THE CLEEREMAN LINE

OF PRECISION JIG BORERS and DRILLING MACHINE

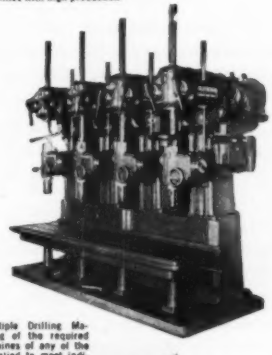


Cleereman Round Column Drilling Machines produce accurate holes at high speed and at low cost and are general purpose machines with high production

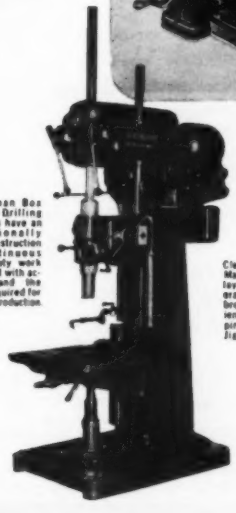
Cleereman Model 325 Single Unit Sliding Head Drilling Machines combine extreme sensitivity with rugged construction, are extremely versatile and may be used for production drilling and tapping.



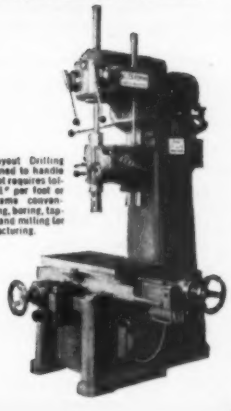
Cleereman Jig Borers, noted for unequalled precision, extreme accuracy, ease of operation in small lot production and in producing tools, dies, jigs or fixtures. Models available with electrically controlled prepositioning.



Cleereman Multiple Drilling Machines consisting of the required number of machines of any of the three types supplied to meet individual requirements.



Cleereman Box Column Drilling Machines have an exceptionally rigid construction for continuous heavy duty work combined with accuracy and the speed required for low cost production.



Cleereman Layout Drilling Machine designed to handle layout work that requires tolerances of .001" per foot or broader. Extreme convenience for drilling, boring, tapping, reaming and milling for Jigless manufacturing.

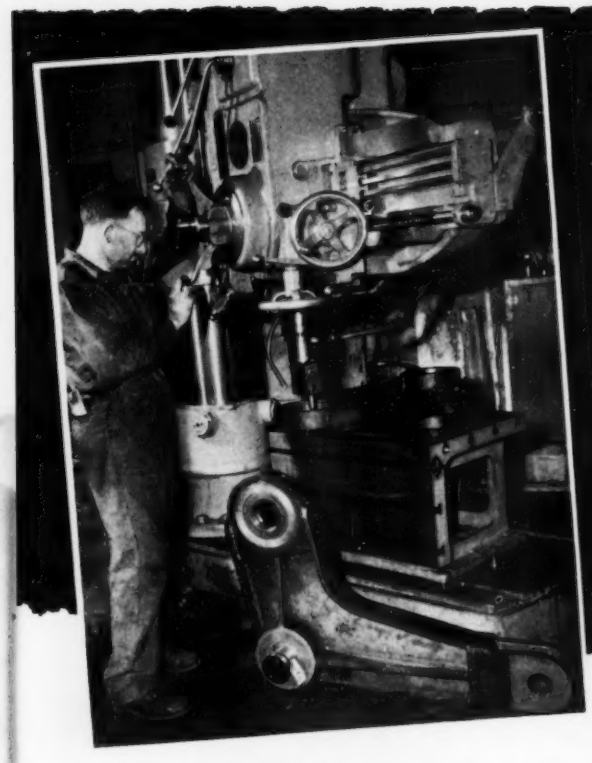
BRYANT Machinery & Engineering Company

General Office
400 West Madison Street, Chicago 6
Representatives in Principal Cities

Affiliated with—

CLEEREMAN MACHINE TOOL CO. Green Bay, Wis.

BUILDERS OF PRECISION JIG BORERS & DRILLING MACHINES



picture of a man making a difficult job... *Easy* with a

FOSDICK HYDRAULIC RADIAL

Difficult jobs such as the one pictured become almost child's play when a Fosdick Hydraulic Radial is brought into use. This particular job required three large bores to very accurate dimensions. The large bore 6½" I.D., the center bore 4½" I.D. and the end bore 2⅜" I.D. with a 2" space between the two lugs . . . each side being 1⅛" thick. Each complete part was drilled and bored from the solid in approximately eight hours.

Some of the features that make the Fosdick Hydraulic Radial an ideal tool for jobs such as these are: LOCKING CONTROL . . . to assist the operator in reducing set-up time.

TOOL EJECTOR . . . automatically disengages the tool . . . eliminating damage to tools caused by the old-fashioned hammer and drift method.

SPEEDS AND FEEDS . . . the head is equipped with 36 spindle speeds and 18 feeds.

ARM . . . is the double box type, reinforced with double I-beam construction. A single directional control lever clamps and unclamps and raises and lowers the arm.

COLUMN . . . 13" to 19" dia. columns with ball bearings at the top and roller bearings at the bottom to facilitate the easy swinging of the arm. Sizes 4' to 8'.

ELECTRIC LIGHT . . . the bottom of the arm is cast in a "U" section in which a Fluorescent tube is placed to provide light to the spindle at any position of the head on the arm.

These are but a few of the many features that make the Fosdick Hydraulic Radial a preferred tool in shops and plants everywhere.

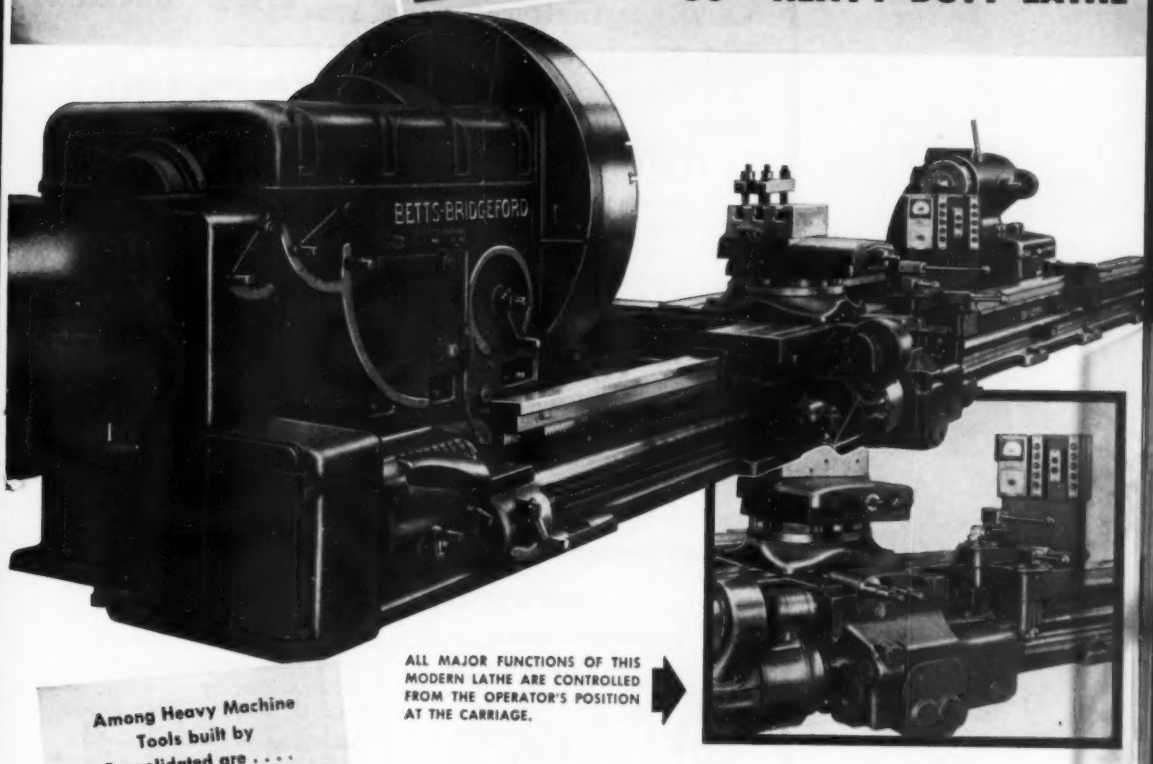
For complete details write for Fosdick Hydraulic Radial Bulletin RDA

FOSDICK MACHINE TOOL CO.
CINCINNATI 23, OHIO

BETTS-BRIDGEFORD

ELECTRONIC FEED

60" HEAVY DUTY LATHE



ALL MAJOR FUNCTIONS OF THIS MODERN LATHE ARE CONTROLLED FROM THE OPERATOR'S POSITION AT THE CARRIAGE.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

- Wide speed range permits use of either high speed steel or carbide tools.
- Feed and traverse functions entirely independent of thread cutting mechanism.
- Feed rate and cutting speed, within the range of their respective motors, are adjustable independently without interrupting the cut.
- Lead screw for thread cutting only.
- All anti-friction bearing headstock.
- Hardened steel bedways.
- Main drive motor speeds and feed and traverse functions are conveniently controlled from the operator's position at the carriage.

- Altogether, this modern lathe embodies the advanced features necessary to meet today's demand by industry for high production with greater accuracy and durability. Full information on this lathe or other Betts-Bridgeford Heavy Duty Lathes from 26" to 144" and larger will be furnished upon request.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

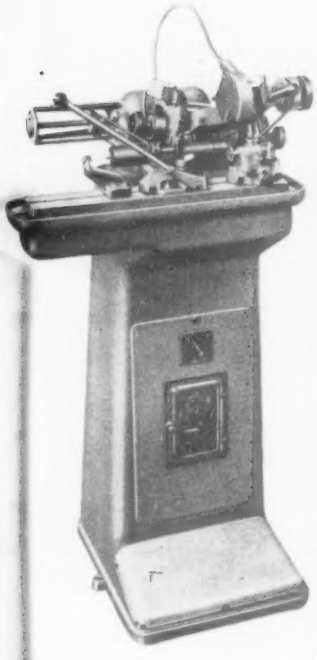
CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

NEW HAUSER BURNISHING METHOD

Faster and More Accurate Than Any Other Lapping, Grinding or Polishing Method Known



HAUSER TYPE 241
Pivot Polishing Machine can be supplied with or without base, as desired.

NOW AVAILABLE FROM U.S. STOCKS

HAUSER Type 241 Pivot Polishing Machine for Wet Polishing — 600 or More Pivots Per Hour

REPLACES CENTERLESS GRINDING

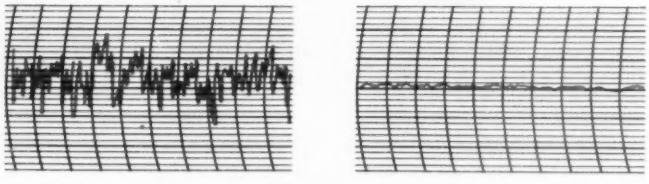
FEATURES:

- Polishes to 0.2 to 0.3 micro-inch R.M.S.
- High precision — Simple operation
- Low Cost Polishing
- Polishing range: Min. dia. 0.008"
  Max. dia. 0.197" Length to 0.315"
- Workpiece length to 5"
- Polishes straight, taper or radius
- Polishes shoulder at same time as cylinders at right angle or bevel as desired
- Polishes wide range of metals
- Takes work in collets or between centers
- Long life carbide or ceramic wheels
- Can be equipped with production-run time switch

Factory Service and Parts are available from Manhasset, N.Y.

ANALYZING CHART

BEFORE BURNISHING **AFTER BURNISHING**



Magnification: 40,000 vertical — 88 horizontal

HAUSER MACHINE TOOL CORP.
AFFILIATED WITH
CARL HIRSCHMANN CO.

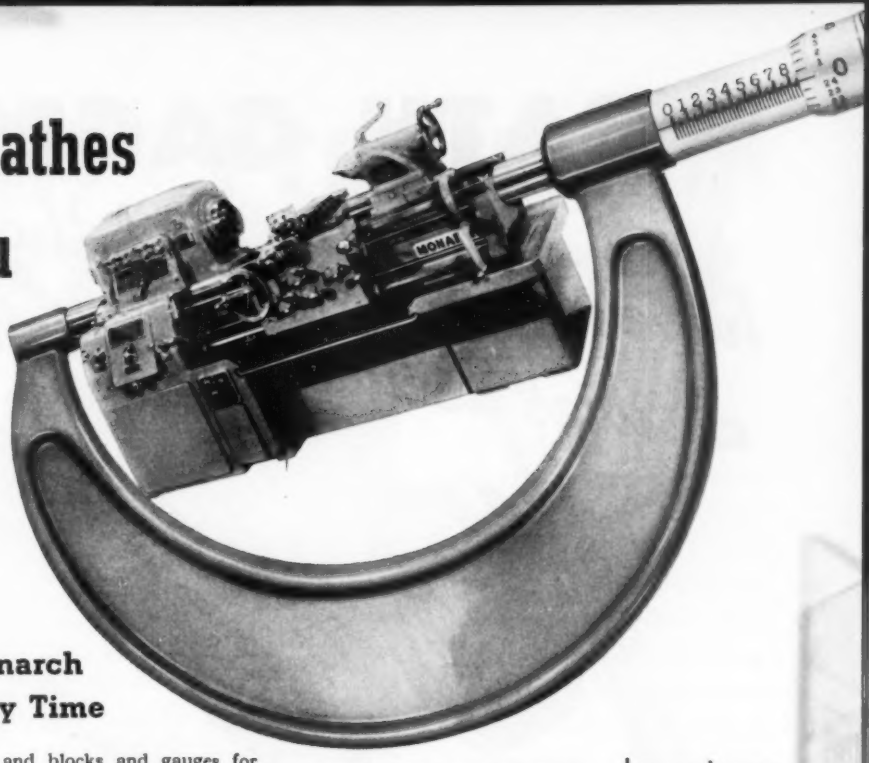
30 Park Avenue, Manhasset, N.Y. • Representatives in Principal Cities

Sole U. S. agents for Henri Hauser Ltd., Bienne, Switzerland — Jig Borers, Jig Grinders, Optical Measuring Machines, Profile Projectors, Burnishing Machines

At 30 Park Avenue, Manhasset, N. Y., is the widest selection of Swiss precision machine tools available from any one address in the United States. Represented here, in addition to Henri Hauser, Ltd., are Tornos Works, Ltd.; Schaublin, S. A.; S. Lambert, S. A.; Safag, S. A.; and Agathon, Ltd., which are handled exclusively by Carl Hirschmann Company.

SWISS *PRECISION CRAFTSMANSHIP* **SWISS** *DEPENDABILITY ACCURACY*

Check Lathes Like You Check Their Output



...and it's Monarch Series 60 Every Time

You have your mikes and blocks and gauges for checking lathe production. But what kind of test is there for the lathe itself? How can you gauge its performance *before* you buy—at the time when you're establishing the standards for the quality and costs of your entire operation?

This way! Lathe performance is only a reflection of the quality built into a lathe—of its features of design and construction. *So check features*—and check them against the handy yardstick here.

Check, too, the strength, weight and power built into each machine. You not only find every desirable construction feature in the Monarch Series 60—you'll find that *almost every one of them was originated* by Monarch. Doesn't that make the Monarch Series 60—Toolmaker's and Engine Lathes, both—the standard that you're looking for? Write for Bulletin 1113, and see for yourself . . . *The Monarch Machine Tool Company, Sidney, Ohio.*

Your proof of protection on all Series 60 Toolmaker's and Engine Lathes, available in 12", 14", 16" and 20" swings—each in various lengths. Most can be equipped with either one of the three Monarch Tracer Controls.

LATHE FEATURE CHECK-LIST	MONARCH	LATHE B
1 Totally enclosed gearbox and end gearing—for sustained accuracy	Yes	?
2 Automatic pressure lubrication—for long life at original efficiency	Yes	?
3 All anti-friction bearings—for peak power and reduced maintenance	Yes	?
4 Hardened, ground or shaved, wide helical gears in headstock—for precision power, easier shifting	Yes	?
5 American Standard Camlock Spindle Nose—for quick, rigid chuck and fixture mounting	Yes	?
6 Flame-Hardened and Precision-Ground Integral Bedways—for sustained accuracy throughout the life of all four ways	Yes	?
7 All critical parts made of hardened alloy steel—for long, trouble-free life	Yes	?

Monarch
ACCURACY • ECONOMY • LONG LIFE
TURNING MACHINES

FOR A GOOD TURN FASTER . . . TURN TO MONARCH

BATH GAGES

*have the background that assures accurate performance**

You have the assurance of many years use of Bath Plug and Ring Thread Gages . . . time-tested in production lines by manufacturers of all kinds of precision products.

Like Bath Taps . . . known for their high quality from coast to coast . . . Bath Gages are made to the most exacting standards. Selected steel, lapped to a high finish, makes Bath Gages extremely wear-resistant. Their accuracy is carefully checked on the finest measuring instruments after each step in manufacture . . . and Bath Gages hold this accuracy to give you the lowest possible cost per part gaged.

A complete line of standard and special Bath Gages is available — including the new Unified Screw Thread System. Accuracy was never of MORE importance . . . write NOW for detailed information.

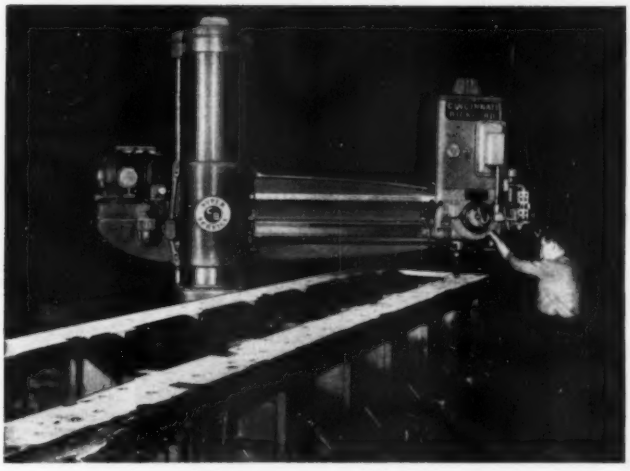
* The same skilled engineering and precision workmanship that creates a preference for Bath standard and special size taps.

Where Accuracy Counts-Depend on Bath Gages

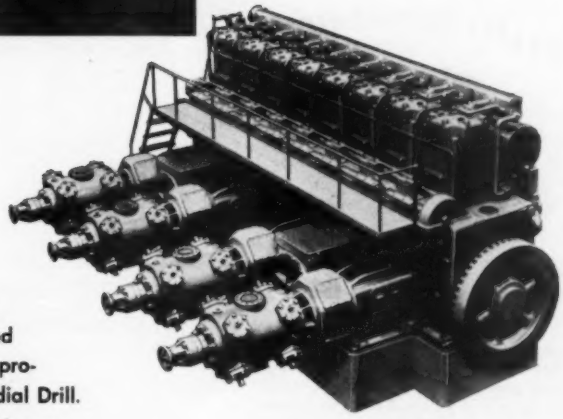
PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.

30% Production INCREASE



At Clark Bros. Company, Inc., Olean, New York, mounted on a sliding base, this 6' arm and 17" diameter column SUPER SERVICE Radial is drilling, tapping and champfering large compressor lower crank cases. A 30% production improvement over previous methods used, is now obtained.



The automatic oiling of the column, ease of movement, and flexibility and convenient positions of the controls, are a few of the outstanding features mentioned by Clark as contributing factors to this worthwhile production increase.

The safety elevating nut—spindle safety catch—power rapid traverse safety—arm elevating safety—safety feed gear—clamping and elevating interlock—are features designed to protect your investment in the SUPER SERVICE Radial Drill.

The 100% centralized controls; convenient low levers; instant spotting with rapid traverse; compensating depth gauge; positive, easy acting feed clutch; 18 rates of feed and 36 speeds, instantly available, are designed to help you increase your production.

For further information on SUPER SERVICE Radial Drills, write for Booklet R-29.

THE CINCINNATI BICKFORD TOOL CO.
RADIAL AND UPRIGHT DRILLING MACHINES
SUPER SERVICE CB
Radials 7½" dia. col. 2½ arm to 26" dia. col. 12' arm
General purpose Uprights 21" to 28" sizes
Production Uprights 21" to 28"
Jig Borers, Portable Horizontals
Spacing Table Machines

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

TRY THIS *cost-cutting team* **for CARBIDE GRINDING**

Wickman Steel-Bonded Diamond Wheels practically indestructible with extra long life. Diamond particles stay in place until completely worn. Finish tools better for longer tool life.

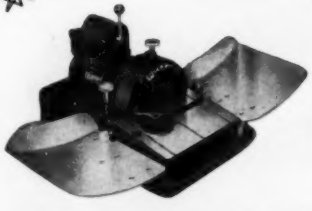
Wickman Resinoid-Bonded Diamond Wheels for faster and freer carbide cutting and less frequent wheel dressing.

Wickman Chip-Breaker Diamond Wheels steel-bonded for much longer life than other chip-breaker diamond wheels. Reduce wheel and tool costs materially and speed grinding 3-4 times.

Complete facts in free 52-page catalog.

Grinding with Diamond or Abrasive Wheels is

☆FAST! ☆ECONOMICAL!



on the Wickman GF-2-A

With 1 HP reversible motor and impeller-type 12 gph coolant pump, this heavy bench grinder delivers fast, economical grinding with both silicon carbide abrasive wheels and Wickman steel-bonded diamond wheels. Wheel guards and splash protectors, three position table for wheel wear adjustment, plus a protractor slot for angular grinding, make this the ideal grinder for all off-hand grinding around the shop.

Delivery From Stock. Send for bulletin.

THE Wickman MANUFACTURING CO.
15533 Woodrow Wilson Ave.
DETROIT 3, MICHIGAN

Backlash

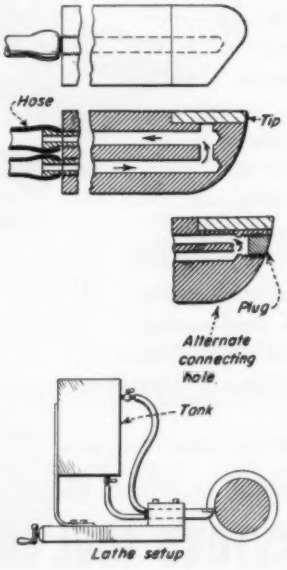
EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

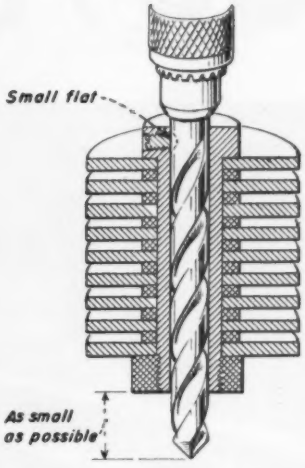
Internal-Cooled Bits

Husky cutting toolbits, like those installed on large lathes and planers, offer considerable room for experiment. When the job is a slow one, with slow speeds called for, and with excess heat generated because of tool friction, it seems to me that the tool itself could be cooled. I'd be interested in finding out what other readers think of this one; which I have not actually tried out as yet.

The problem is removing heat from the tool, and a direct way to do this is to run water through cooling holes in the tool itself, as you have suggested in *AM* articles on high-speed machining. Of course a tool with holes through it would have to be designed that much larger for a given job, the drilled holes would have to be small, and the water would have to be circulated rapidly.

As illustrated, two longitudinal holes can be drilled into the bit from the rear end, the holes can be countersunk, and suitable brass fittings can be added to retain the coolant





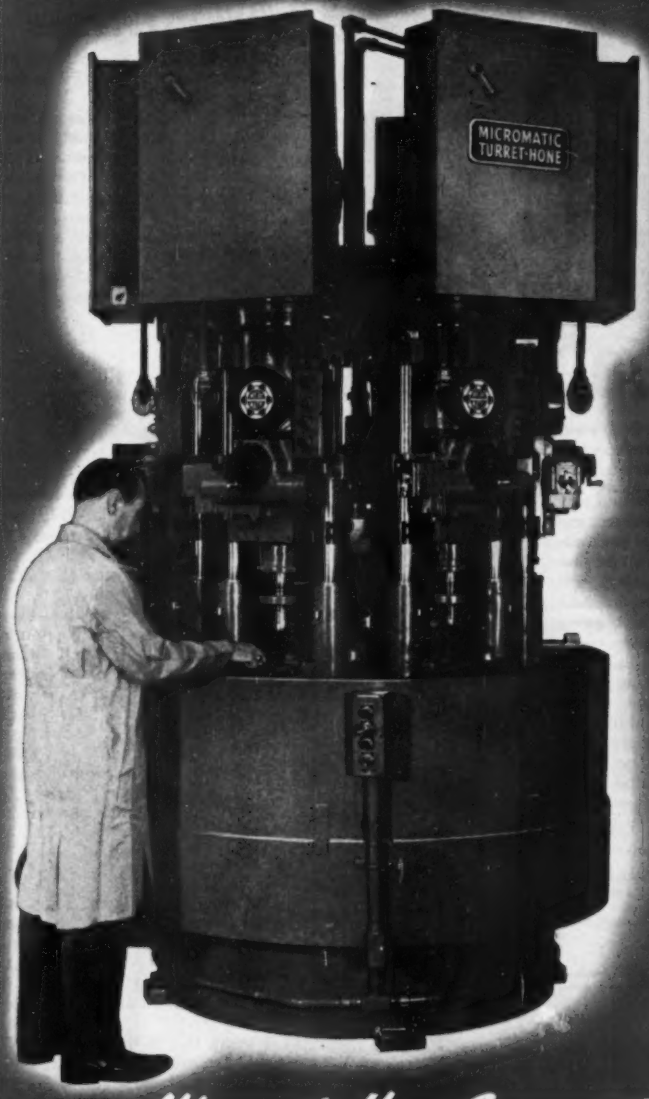
hoses. A connecting hole can be drilled to intersect the two main holes before the carbide tip is brazed on. An alternate way of doing this —also a way to do it for solid tools that don't have carbide inserts—is to drill a large hole in the front end of the bit and plug it firmly.

Another variation on this idea of cooling the tool directly is to fit a drill with a radiator. This can be built up from disks made to fit the drill tightly. This idea would be most practical on a drill that only must penetrate the stock slightly. As shown, a long collar can be made to force onto the drill, then cooling disks can be clamped to the outside of the collar.

John Dernoga
Rochester, N. Y.

Mr. Dernoga's suggestions for bit cooling appear possible, and follow the lines of those made by engineers having experience with high-speed machining. But, as far as we are aware, no actual experiments have been made. The drill cooling device, on the other hand, seems impractical because cooling is not a major problem in drilling thin sections, heat-transfer contact between cooling fins and drill is poor, and chips will almost certainly foul in the grooves. Do other readers have experience or opinions?—ED.

NEW *High Production ★ High Precision* TURRET · HONE



SIX MICROHONING UNITS

One Machine One Operator

THIS new model 736-6 TURRET-HONE finishes a part every five seconds. The operator unloads and loads the fixtures as they pass the control station. As the loaded fixture leaves the control station it automatically lifts into position, the tool starts rotating, reciprocating and expanding. The machine rotates continuously. When the part is "to size" the automatic MICRO-SIZE control stops the tool and drops the fixture. As the fixture passes the operator again, a new part is loaded and the cycle continues. This is repeated on each unit.

MICRO MATIC

Micromatic Hone Corporation 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

District Field Offices: 1323 So. Santa Fe., Los Angeles 21, California • 614 Empire Building, 206 So. Main St., Rockford, Illinois
55 George St., Brantford, Ontario, Canada • Micromold Manufacturing Div., Boston Post Road, Guilford, Connecticut

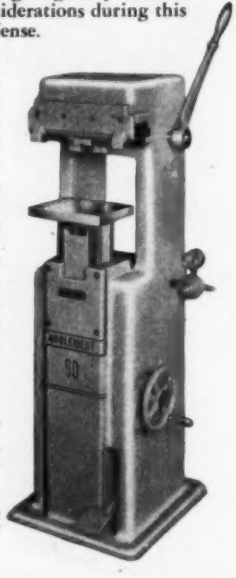
LEADERS IN INDUSTRY MARK WITH NOBLEWEST

How Noblewest helped a leading typewriter company to improve serial numbering on typewriter frames — increase production speeds — and greatly reduce manufacturing costs.

SERIAL NUMBERING 600% FASTER

HERE is another example of how Noblewest marking equipment pays big dividends in faster, better marking at greatly reduced manufacturing costs—all mighty important considerations during this period of greatly accelerated production for defense.

A standard Noblewest general purpose marking machine was tooled for roll marking consecutive serial numbers permanently into die-cast typewriter frames—with a resulting 600% increase in production speed over the method previously used. Features of this Noblewest marking equipment include rocker-style numbering head with newly developed indexing mechanism for automatically advancing serial numbers at each stroke of the machine. Pneumatic table pressure assures positive uniformity of depth of inscription and compensates for slight variations of part thicknesses. For information on how Modern Marking Methods can cut costs in your plant, write the Noble & Westbrook Mfg. Co., 17 Westbrook Street, East Hartford 8, Conn.



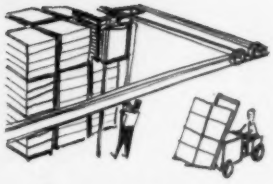
(Right)—The completely new Noblewest Model 50P with pneumatic table pressure. Can also be furnished with manual or all-pneumatic operation.

(Left)—Noblewest precision-built rocker-style automatic numbering head.

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

EQUIPMENT FOR MARKING · GRADUATING · EMBOSSING · NUMBERING



May Pile Pallets Higher

January 8, 1951 AMERICAN MACHINIST, p106, discussed "Stacker Crane Saves Storage Space," . . .

Here, at Euclid, we have a warehousing problem that might lend itself well to adaptation of the "Stacker-Crane" idea. Our present warehouse has an exceedingly high ceiling. . . . To date, however, we have been unable to take advantage of this height due to limitations in working height of our lift trucks and safety hazards encountered in handling high stacks.

The "Stacker-Crane" idea, we believe, has possibilities for application in our warehouse in conjunction with pallet racks. Through pallet racks we would eliminate the problem of removing material from the bottom of a high stack and in some measure lessen the safety hazard.

J. L. Howe, *Industrial Engineering Dept., The Euclid Road Machinery Co., Cleveland 17, Ohio*

The American Monorail Co., 13107 Athens Ave., Cleveland 7, O., who produce this crane under license from E. I. du Pont de Nemours & Co., Inc., will send you full information on the stacker crane. However, Fred Miller of du Pont, in discussing high-stacking at the Westinghouse Materials Handling Conference, felt that something around 14 to 15 ft was the limit for pushbutton operation of the crane from the floor. Beyond this, he felt that the operator should ride with the load.—ED.

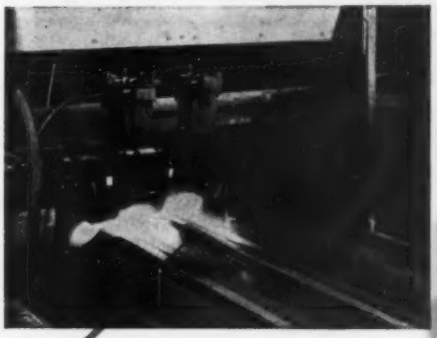
Defense Guide

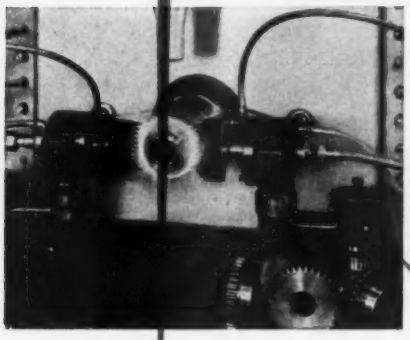
Will you kindly have your office send us twenty-five (25) additional copies of the "Metalworking Guide to Defense Business" supplement of your January 22 issue of the AMERICAN MACHINIST and bill us accordingly.

I think this is the most complete aid I have ever seen in assisting local people to find the right sources for information on government orders. Thank you very much for your cooperation

G. STANLEY RUTH
Secretary-Manager
Altoona (Pa.) Chamber of Commerce

flame facts





Flame hardened gears throughout are standard . . . **flame hardened bed ways** are available at small extra cost . . . in Tray-Top light duty all geared head engine and toolroom lathes. Add these plus values to **versatility:** 12 spindle speeds, 48 thread and feed changes, top speeds to 1800 rpm., quickest changeover from English to metric thread chasing . . . **operator convenience:** centralized controls, instant speed selection with direct reading color-match speed selector, dual control levers, "Tray-Tops" on headstock and tailstock for parking tools, mikes, gages, etc. . . . **operator safety:** totally enclosed change gear box, totally enclosed electrical panel, accessible only by opening master disconnect switch, feed levers disengaged in down position . . . **floor space savings:** cabinet legs really have room for chucks, face plates, etc., reduce or eliminate need for separate bench or storage space . . . Add up all Tray-Top's outstanding values and you'll find it your best buy. Swing sizes: 10", 12½", 15", 18". Write for new bulletin.

CINTILATHE

OF OUTSTANDING VALUE

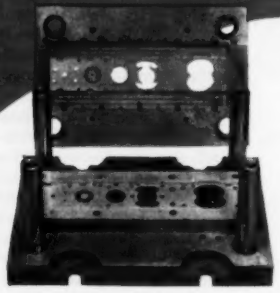
CINCINNATI 9, OHIO, U.S.A. **cincinnati lathe & tool co.**

160 pieces a minute to tolerances of less than .0005"!

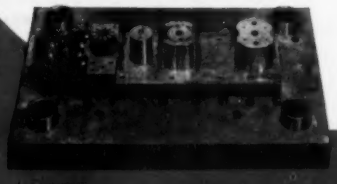
These rotor and stator elements are stamped in the six station die shown below in a 50-ton press at 80 strokes per minute. With half thousandth piece part tolerances, almost perfect die alignment is a must! That's why . . .

they built the die in a

DANLY PRECISION DIE SET



Die built by the Sherman Tool & Die Co., Charlestown, Massachusetts, for the Signal Manufacturing Co., Lynn, Massachusetts, in a Special Danly Precision Die Set!



Danly precision makes every Danly Die Set a reliable base for the finest die work. They save time in the die shop because they are square and true . . . they assure longer production runs in the press because precision closure protects die components.

Standard Danly Die Sets are quickly available from a nationwide system of completely stocked assembly branches. Just phone for fast delivery, and for the finest in die set precision, always specify Danly.

DANLY MACHINE SPECIALTIES, INC.
2100 South 52nd Avenue Chicago 50, Illinois

PRECISION DIE SETS . . . STANDARD AND SPECIAL

DANLY®

SPOT NEWS of Metalworking

- **Enough defense contractors are behind in their schedules** that the Munitions Board is considering ways and means of speeding up deliveries. Feeling is that some of them are "dragging their feet" because they still are concentrating on filling lucrative civilian products orders.

- **Cincinnati Milling Machine Co. has received certificates of necessity** for two machine tool expansion projects totaling $7,629,558 and for expansion in abrasives and grinding wheels amounting to $374,000. Lapointe Machine Tool Co. has been granted a certificate for $1,399,064 to enlarge broaching machine production facilities. For list of certificates of necessity approved by DPA, see page 184.

Titanium alloys with strengths of from 18,000 to 200,000 psi suitable for some aircraft uses are expected in a few months, it was disclosed in a panel discussion at Western Metal Show. Use of titanium to stabilize certain stainless steels would help conserve vital columbium, it was declared. (See page 135.)

- **Plants with military contracts must use coal or gas as fuel where possible,** armed forces are demanding at behest of Munitions Board. Idea is to save oil for combat forces. Its a long-range project—there's no immediate or imminent shortage of liquid fuel for combat.

- **Stabilizer Johnston would like, after June 30, to (1) freeze wage escalator** clauses; (2) hold farm prices at dollars and cents ceilings; (3) squeeze profits. Privately, he says these steps are necessary to put real brakes on inflation. It's doubtful he can sell the administration on them.

- **Contract for jet components held by Willys-Overland** is valued in excess of $63 million. The work, which will be done at Anderson, Ind., plant purchased from Chevrolet, includes forging, welding, and machining operations. For the present, the 1200-man force to be employed at Anderson will carry out these assignments by themselves, with no subcontracting planned.

Automobile companies have been assured enough steel to make trucks and military vehicles and an adequate supply of repair parts. This means that the truck business is getting the green light as it did in World War II.

- **New process for chemical polishing of aluminum,** said to be less expensive than similar systems used abroad, has been developed by Light Experimental Institute of Italy. Outer lamina of metallic surface is dissolved, reducing thickness by 0.015 to 0.025 mm according to length of immersion and temperature of bath.

- **Many types of plastics are in shorter supply than steel or aluminum,** Frank H. Carman, assistant secretary for plastics of Manufacturing Chemists' Association, says. Thus manufacturers who plan to substitute plastics for scarce metals had better look twice if they don't want to be disappointed. Plastics make poor substitutes if improperly used, he stated.

- **Midwest maker of electric furnace steel has lost 50,000 tons of production** the past 60 days because of shortage of suitable scrap. Scrap scarcity is traced to: (1) peak steel-producing rate; (2) slump in imports; (3) little scrap from railroads; (4) less scrap from metalworking companies which are utilizing more completely the steel supplied them.

- **A new type amphibious cargo carrier operating on tank-type tracks** with a stern-type propeller will be built by Pontiac Division of General Motors under a $45-million contract. Main work will be done in Pontiac plants, with Continental Motors Corp. supplying engines for the carriers. Some 500 outside firms will furnish other parts. Pontiac also has been awarded a $12-million contract to make rockets.

CTW
Ground Multiple Thread Milling Cutters
Special Inserted Blade Multi-Diameter Cutter
Carbide Tipped Sections of Sine Form Broach
Special Hand Detachable Cutter
Ground and Unground Form-Relieved Cutters
Hand Detachable Elevated Spot-Facer
Removable Tip Core Drill
Carbide Tipped Chordal Form Tool
Carbide Tipped Dovetail Form Tool
Combination I.D. and Involute Spline Broach
Solid Carbide and Carbide Tipped Single-Point Tools

Continental "PRODUCTION TESTED" CUTTING TOOLS

Continental cutting tools and broaches are at work day after day on production jobs in Ex-Cell-O plants. This "production testing" is one reason for the consistently superior results you get when you specify Continental. Equally important are two other factors:

Expert design, **by Continental's experienced staff of tool and broach engineers.**

Efficient processing, **including careful heat treating, in the Continental plant; skilled craftsmen working with modern machine tools.**

The Continental line includes standard and special cutting tools, broaches and broach fixtures. Order standard tools from the Continental catalog. For specials call your Ex-Cell-O representative or write to Continental.

CONTINENTAL TOOL WORKS

CTW

DIVISION OF EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

51-8

Washington

Another 18 months of shortages and controls. That's how the mobilizers see it right now.

Here's how it adds up: by late 1952 we'll have arms production rolling. We'll also have the basic production — steel, aluminum, other metals — to back it up.

• • •

The military build-up will continue through 1953. That's when we'll reach the military manpower goal — something close to 3-million men under arms, with equipment for a year of war. And we'll be able to expand this force rapidly.

The industrial build-up will end earlier. Most new plants now planned will be ready in 1952. Some of it will be standby, operating at a fraction of full capacity. But it will be tooled up and manned, ready to go full blast if needed.

Controls will be slackened about the same time. By mid-1952 the military will have most of the materials they need, though not all finished items. And the other big drain on supply of materials — for new production facilities — will be tapering off.

The 18 months of tough controls is just a goal. The mobilizers think now we can make it — if. If the international situation doesn't worsen, if no unforseen tangles develop in materials supply, if the economy remains healthy enough to support the defense program on schedule.

• • •

Wage controls will be further modified to correct some unfairness in Eric Johnston's approval of cost-of-living escalator contracts above the 10% ceiling.

Complaints are pouring in from employers as well as unions whose contracts permit specific step-up increases not tied to living costs. Others with simple wage reopeners—with no strings—feel they are entitled to comparable increases.

• • •

Mobilization policy on plant expansion is "soft." That is, production essential to either military or civilian requirements may qualify for federal aid during the defense build-up.

The policy battle still rages in Washington. Some of mobilization boss Wilson's top aides are still holding out for a tough approach: No help for anything which won't produce military equipment. But they've been overruled—for the time being, at least.

DPA chief Harrison settled the policy squabble. He gave the green light to five-year tax amortization for a long list of new facilities, including nearly a score for machine tool production. They'd been held up because they did not involve direct military production.

Fast tax write-offs remain the chief form of aid offered by the government for expansion. But purchase commitments and loan guarantees will be granted for "essential" facilities that need them. Direct government loans will be few and largely military output.

Five-year amortization standards stay about the same: The closer a project is tied to direct military needs, the more of its cost may be given fast write-off. But there'll be a few, if any, more certificates covering 100% of any new plant. The range will be from 50% to something over 80%.

• • •

Raw materials still worry the mobilizers. There's enough basic steel and aluminum production, in being or on the way, to meet mobilization and minimum civilian requirements. But more steel fabricating, especially of plate and tubing, are needed.

And there's no end in sight for shortages of copper, chrome, cobalt and a host of other materials. These are things for which we are dependent largely on foreign sources which are either in (a) "unsafe" areas, or (b) incapable of rapid expansion.

• • •

DO priorities are sagging in the middle—and at both ends. You can see that in the complaints about maintenance, repair and operating supplies.

MRO priorities are virtually worthless. There just aren't enough supplies to meet the priority (DO-97) demands. One reason: enormous buying of MRO by the armed forces.

Washington has no solution for the MRO mess. It's virtually impossible to stop military buying or even slow it down. National Production Authority is considering keeping closer tabs on non-military use of priorities but doesn't expect that to help much.

• • •

Military gripes about DO's also are mounting. In spite of priorities, materials shortages have delayed deliveries of some tanks, artillery shells, rockets, trucks, ship conversion and equipment components, Munitions Board says.

But the mobilizers are clinging to the DO's. They will try to hold out until CMP comes. They'll up amount of steel and aluminum producers must devote to DO contracts as a stop-gap.

• • •

Accent in military contracting is switching from ammunition and weapons to other items. Right now the services are concentrating on electronics equipment, ships, trucks and jeeps, tools and other plant equipment.

Average diameter of a hole
Bearing race matching
Angle between bore and face
Diameter
Thickness
Bore center distance
Crank throw, eliminating all error due to diametral tolerance
Twist
Bend
Typical Dimensions and Relationships measured with Sheffield
PRECISIONAIRE GAGES
The range of dimensions and position relationships which can be measured quickly and precisely by Precisionaire Gages is almost limitless. In fact, some such measurements are possible otherwise only by elaborate auxiliary equipment in a well equipped laboratory to obtain the same degree of accuracy. Illustrated here are typical Precisionaire applications in which deviations have been exaggerated for greater clarity.
Precisionaires are the only gages which offer the combined advantages of greater linear scale length, amplifications of less than 1,000 up to more than 100,000 to 1, and instantaneous accurate reading regardless of the distance between the gaging element and the base instrument.
"If it can be gaged by air, it can be gaged best by Precisionaire."
Write for Precisionaire Application Book—
or call your Sheffield Representative.
the Sheffield corporation
Lobing or cloverleaf of a centerless ground shaft
Internal radial clearance
Flatness
Distance between hole centers eliminating all error caused by diametral tolerance
Center distance of incomplete holes eliminating all error caused by diametral tolerance

Detroit

Materials continue as the worst problem to plague machine tool and smaller parts builders. The machine tool men find steel hardest to get, then copper wiring and electrical motors.

They're still able to get the skilled craftsmen they need, although there are growing problems of this sort.

• • •

Backlogs keep enlarging. The past month or two has seen practically no civilian goods tooling releases; the present enlargements are all on military account.

Inventories are starting to level off in Detroit plants. The leveling, of course, is from a definitely lofty point. February reports indicate that about half of a number of representative inventories in Detroit stayed the same at the end of the month as they were at the start. A month earlier the general tendency was for a decline of sorts.

This probably ties to the commodity price picture as Detroit purchasers see it. Nearly half of them report that price levels are the same as at the start of February. Where almost all found prices increasing in January, only a little more than half saw advances continue in February.

There is more long term buying — six months or so — than there was at the start of the year. Hand-to-mouth buying is also increasing. The indication: Middle term buying — two to three months — seems to be reducing.

• • •

Automobile production has been confounding the pessimists. It bounded up during early March to a level around 180,000 cars and trucks a week, and held that rate through the balance of March.

The second quarter story will be different. The primary restrictions on manufacturing will be the cutback of steel to average 80% of the tonnage used during the first half of 1950. In that period last year approximately 3,758,000 cars and trucks were built in U. S. plants. On that basis, the second quarter's production would diminish to about 1,500,000. However, there are other problems besides steel. Copper is getting tighter by the day. Aluminum piston problems will begin to make themselves felt midway through the second quarter.

The first effects of government restrictions on materials have already been reflected in automobiles. General Motors laid off 1600 people at Fisher and Chevrolet plants near Cincinnati, having previously made similar layoffs at St. Louis. Second shifts were eliminated at these operations. Ford has begun layoffs of several hundred people at the Canadian plant because of slower flow of suppliers.

Large-scale plant conversion is taking place at Kaiser-Frazer Willow Run. One-third of plant space — 1-million sq ft — is being tooled up to produce C-119 Fairchild Cargo carriers for the Air Force. Source of tools is largely the World War II mothball yards — K-F has over 20 carloads of such production equipment ready for installation. The company plans to maintain present output of 900 cars per day by shifting facilities, adding an extra shift.

• • •

The nine-figure aircraft orders continue to pour into Detroit. The latest is the Packard Motor Car Co., for General Electric J-47 turbo jet engines. Indicative of the size of the job — one of the largest yet to reach Detroit — is the fact that fourteen months will be required for tooling. Another clue: Packard now employs 9,000, may need 28,000 eventually.

When Allison division of General Motors unveiled its new super-jet engine and presented the 10,000th jet to the Air Force, suppliers gathered in force to help celebrate the occasion. One and all, they privately praised Allison as the kind of prime contractor they liked to work for.

• • •

What makes a good prime? Listen to one big supplier: "Things don't get changed around from day to day. Sure, they change the specifications; everyone does; but their changes seem to be held at minimum.

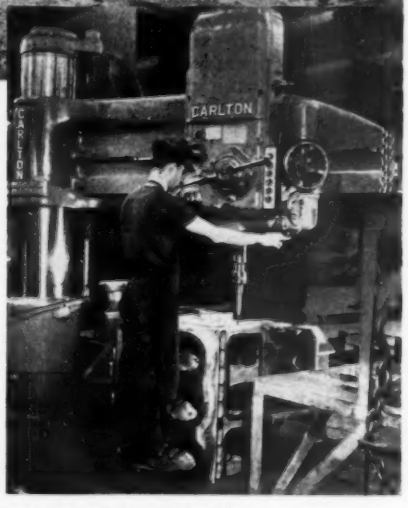
"This is important, too — we get fast decisions on things. When we want to do something we tell 'em and, bang, back comes the answer. No waiting around, no hanging in midair."

• • •

The auto industry is taking a look at the last of the 1951 new models — the Super "88" Oldsmobile. Like its predecessing Series 88 and 98, introduced in January, the new Olds offers an improved, higher compression engine; quick-reversing Hydra-Matic drive; leaf-type rear springs. Style-wise, the Super 88 comes in the new, wider, middle-sized General Motors "B" body that first appeared on the 1951 Buick Special series.

• • •

Despite a strong challenge from Buick, Plymouth wound up the 1950 calendar year in its traditional third place. The volume producer of Chrysler Corp. registered 547,367 cars during the year, compared with 535,807 Buicks. The first quarter Chrysler strike in 1950, of course, shaved Plymouth totals down very considerably. Given equal production opportunities, Plymouth will maintain its lead over Buick for some time to come.



"CATERPILLAR" COUNTS ON CARLTON

to help build earthmoving machines

This new 22-ton "Cat" DW20 tractor "handles" almost as easy as your own passenger car . . .thanks to intelligent "Caterpillar" designing and engineering.

The same kind of thinking and planning that makes "Caterpillar" heavy duty road machinery so easy to operate has also been used in designing Carlton radial drills, many of which were used in the manufacture of the new "Caterpillar" earthmoving machines.

Carlton heavy duty radials are easy to operate because they are designed with the operator in mind. Carlton's centralized controls . . . most of which are electric push buttons . . . take the work out of running a radial. "Caterpillar" and other Carlton customers say this operator comfort and convenience pay off in increased production every time.

If you're looking for ways to step up **your** drilling and boring production, you'll want to send today for your free Carlton bulletins. Address

THE CARLTON MACHINE TOOL CO.

CINCINNATI 25, OHIO

THE CARLTON MACHINE TOOL CO.

Machine Tools

Pending price controls, rolling prices back to pre-Korea, are causing consternation in the machine tool industry.

Washington has prepared Order No. 136 of the Office of Price Stabilization, which applies to heavy machinery. It permits a manufacturer to establish a base price equal to the highest price during the first six month of 1950, adjusted upward to cover increases in "factory" labor and materials. A ceiling of 10% is put on such adjustments, however.

The new ruling makes no allowance for higher costs arising from subcontracting. It does not take into account overtime costs.

"Factory" labor is believed to include indirect as well as direct labor increases. But there is no clear-cut decision on that important point.

• • •

Machine tool people have protested vehemently against application of Order No. 136 to them. They propose instead a separate order to cover their own situation, which they think differs from other machinery industries.

What they would like is an order patterned after OPA Order No. 57 in World War II, which froze prices as of Oct. 1, 1941, but made allowances for certain added costs.

A task force from the machine tool industry met with OPS officials in Washington March 29 to try to work out an order for machine tools alone. Whatever the final decision is, the working base will be pre-Korea.

The price-freeze formula has a strong political tinge. Wage rates have been frozen as of January, 1950, plus 10%. The general price formula for all manufactured goods and machinery is to be pre-Korea plus 10%.

• • •

Pool orders are slow in coming out. The first one was cleared through NPA's Machinery Division on March 15 and went to General Services Administration for final processing.

The delay is not NPA's fault. Truth is that after NPA issued Order M-40 (pool orders), GSA decided to play safe and limit its pool order commitments to $100 million instead of the $390 million originally planned.

Initial round of pool orders thus will be within the $100-million total. The most urgently needed types of machines will be included in this round.

Chances are that pool orders beyond $100 million will not be issued in next 60 days, if at all.

This means that the time to complete getting out pool orders will be stretched longer.

• • •

Washington denies the report that John Bertram or any other Canadian builder will participate in pool orders. NPA says that such action is not legally possible. Awards must be confined by law to U. S. firms.

Canadian builders, on the other hand, can assist greatly by taking some of the British business with which U. S. builders are being deluged.

• • •

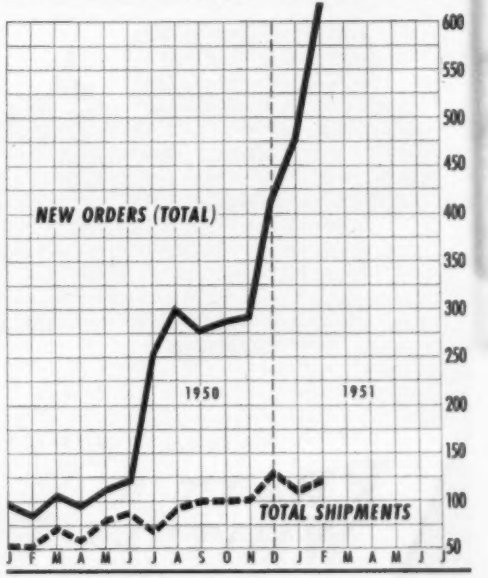
Machine tool orders placed in February skyrocketed to 615.8 on the index of the National Machine Tool Builders' Association. Builders predict that March will equal or be close to February's total. Bear in mind that pool orders will not be felt until April.

Shipments in February stood at 122.2, up only a little from January and below December.

The backlog of the industry represents 20-months' business at current production rate. That is the worst situation, from standpoint of deliveries, that the industry ever has been in. Deliveries are much more extended than at the peak demand of World War II.

Unfilled orders are reported to be not far from $650 million. The situation will get more critical before it improves.

Machine Tool Orders Zoom to 615.8 on Index



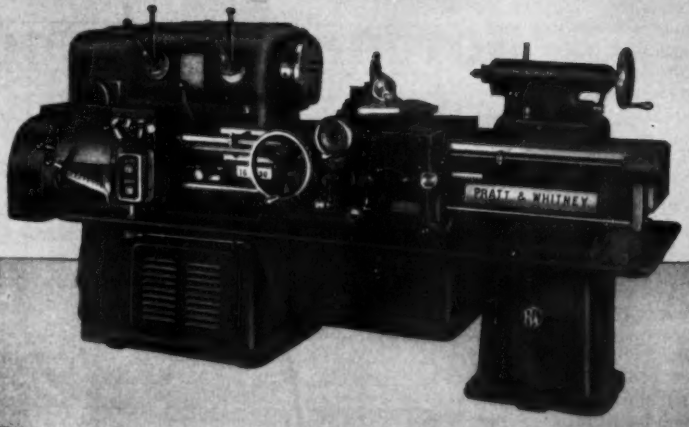
	Jan. '50	Apr. '50	July '50	Oct. '50	Jan. '51	Feb. '51(p)
New orders	99.7	98.9	253.1	289.6	475.4	615.8
Foreign orders	26.7	17.4	22.3	49.5	61.3	80.1
Shipments	52.8	61.6	68.3	100.9	114.3	122.2

(p — preliminary) *National Machine Tool Builders Assn.*

Model "C"

PRECISION LATHES

12 INCH 14 INCH 16 INCH



QUICK CHANGE GEAR BOX

Smooth, silent shift to any thread or feed indicated on direct-reading index plate. All controls grouped for convenience.

SUPER-PRECISION SPINDLE

Mounted at front end in two pre-loaded precision bearings; at rear end in anti-friction type needle bearing.

CAM-LOCK SPINDLE NOSE

A Pratt & Whitney development now standard on most quality lathes. Provides greater rigidity in holding chuck or face plate on spindle. Safer, more convenient mounting — cannot "freeze" on.

REMOVABLE APRON FRONT

safeguards initial accuracy. No need to remove apron assembly, or disturb the separate precision lead screw, when making adjustments.

HARDENED AND GROUND WAYS

provide permanent stability and accuracy. Finish-grinding on special machines assures perfect bearing and superb smoothness.

THE STANDARD BY WHICH ALL FINE LATHES ARE JUDGED

PRATT & WHITNEY

Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

"THERE'S NO BETTER-PAYING INVESTMENT THAN THE RIGHT TOOLS FOR THE JOB."

How many lives is a dollar worth?

The cost of a machine, fixture or broach is no gage of how well they will work together and produce together in any broaching installation—and in no process is proper relationship of tools, fixtures, and machines more vital than in broaching.

The wrong broach, fixture or machine always costs MORE.

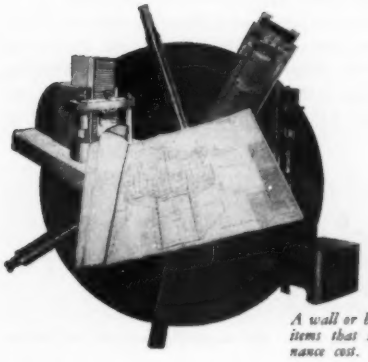
That cost, today, is measured not only in waste of time and money but potentially also *in American lives.*

The time is now. The place—wherever broaching is being adopted to produce more goods—faster . . . with the minimum of precious manpower . . . with the minimum of shut-downs.

To do that, broaching equipment—machine, fixtures, broaches—must be designed, integrated and built to do the job "right the first time."

That's why Colonial is ready and willing to check over your broaching layouts and recommend such changes as appear desirable on the basis of its vast experience with practically every conceivable type of broaching installation.

It costs you nothing. Have Colonial's specialists check broaching equipment or tooling before you release that order.



PIONEERS OF H.S.S. BROACHING

COLONIAL

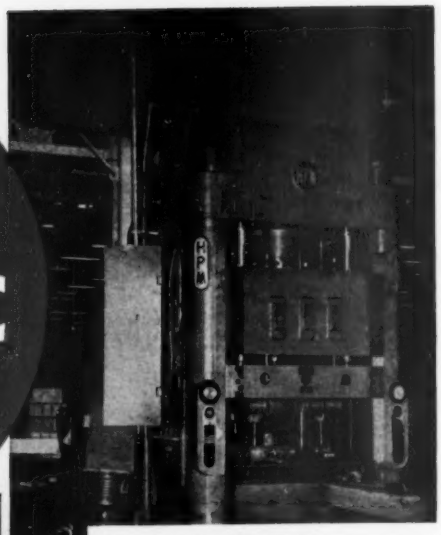
BROACH CO. DETROIT 13

FOR YOUR TOOL ROOM

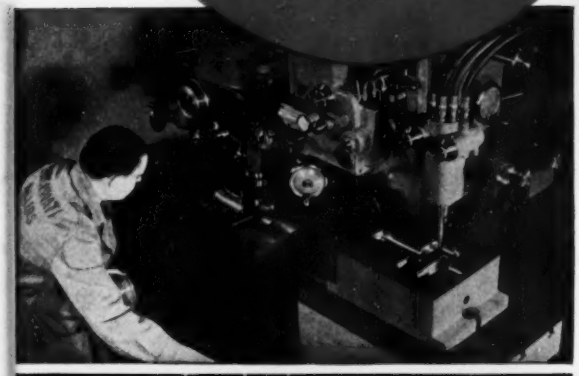
A wall or bulletin board poster of DO and DON'T items that should help you reduce broach maintenance cost. No charge. Ask for BN-1250.

Use Texaco Regal Oils (R&O) and assure

UNFAILING HYDRAULIC POWER



FOR FORMING PRESSES—Big presses and little ones transmit their power more smoothly—and *keep on working without unscheduled stoppages* — when charged with *Texaco Regal Oils (R&O)*. With harmful rust and sludge formations eliminated, pumps and valves stay clean . . . wear is greatly reduced . . . maintenance costs come down.



FOR DRILLING AND CUTTING—Unlike ordinary oils that have a tendency to foam and cause erratic motion, *Texaco Regal Oils (R&O)*—specially processed to prevent foaming—assure smooth, even motion for the most delicate adjustments. This is important in maintaining high production of top quality work and in reducing rejects.

FOR GRINDING — A large midwestern plant reduced hydraulic oil consumption by 74%, simply by changing to *Texaco Regal Oils (R&O)*. These turbine-quality oils keep hydraulic systems free of rust, sludge and foam . . . give longer service between oil changes.

For every hydraulic use

Leading hydraulic equipment manufacturers approve *Texaco Regal Oils (R&O)*, and you can get the exact viscosities you need to assure best possible performance from every type and size of hydraulic unit. Let a Texaco Lubrication Engineer give you full details. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

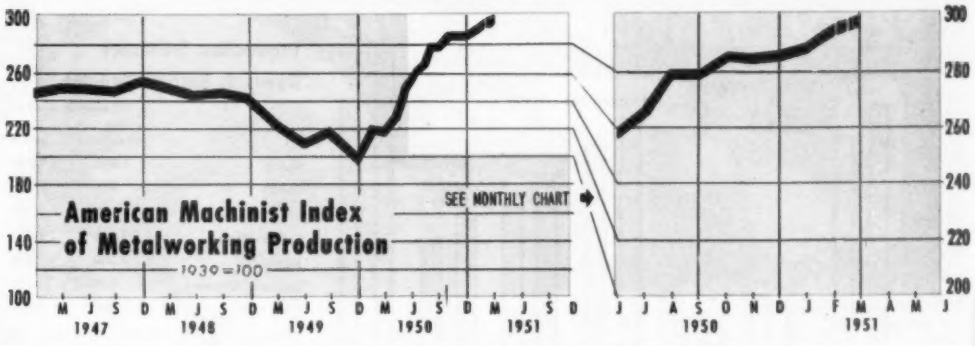
TEXACO

TEXACO Regal Oils (R&O)

FOR ALL HYDRAULIC UNITS

TUNE IN . . . TEXACO STAR THEATER starring MILTON BERLE on television every Tuesday night. See newspaper for time and station.

Gaging Metalworking



Metalworking Boom Continues Strong

Metalworking shows signs of continuing its current boom through most of the first half of 1951. Not until the third quarter will limitations on the use of metals be seriously felt.

Automobile industry is a shining illustration. First quarter assemblies are put at almost 2 million cars and trucks. That is some 340,000 ahead of the same quarter last year.

There is good reason to believe that January-June assemblies will match those of a year ago.

• • •

Industrial expansion promises to zoom all year. Manufacturers plan to invest $21.5 billion in new plant and equipment, or 45% more than in 1950. The catch is whether they can get enough construction materials.

There is hardly a durable goods maker who does not have crammed order books. Though steel is tough to get, and so are other metals, production looks pretty rosy for the next three months.

• • •

Appliance makers seem to be the weakest spot in metalworking. Television and radio set manufacturers have cut prices and lowered output as retail purchases fell off, partly because of credit restrictions.

Refrigerator and range companies may have to put the brake on production later on because dealers are getting overloaded with stocks. Makers of other appliances report much the same situation.

• • •

Metalworking plants, in the main, will stay loaded with business. Big deterrent will be tonnage of steel available.

Many users are scouring every source, including foreign. Those who did not make arrangements for conversion steel or imports are largely out of luck now.

Steel output is running at a fabulously high rate — 105 million tons of ingots and 83 million tons of finished steel a year.

• • •

Gray iron foundries are operating at peak of capacity, but only small ratio of business carries DO ratings. Defense orders, however, are growing. They will be sufficient by middle of second quarter to offset anticipated decline in civilian orders.

Foreign sources of pig iron are drying up. European nations need their "pig" for their own rearmament programs.

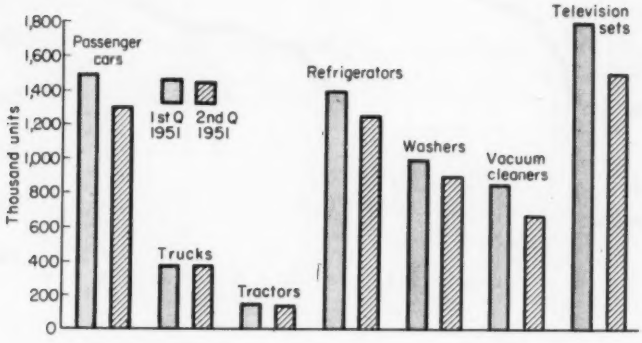
INDEX

	MAR. '51	FEB. '51(p)	JAN. '51(r)	MAR. '50
	297*	294	288	220
Machinery		292	285	213
Electrical Manufacturing		328	327	258
Automobiles, Trucks		241	241	195
Transportation Equipment		339	313	210
Other Metalworking		306	300	242

AMERICAN MACHINIST'S INDEX OF METALWORKING PRODUCTION is based on manhours worked in the five components above.

* Estimated (p) Preliminary (r) Revised

Gaging Business



Production Estimates Down in Second Quarter

	(Thousands of units) 1st quarter	2nd quarter
Autos	1,500	1,300
Trucks	375	375
Tractors	150	140
Refrigerators	1,400	1,250
Washers	1,000	900
Vacuum Cleaners	850	675
T. V. sets	1,800	1,500

(Figures are based on latest estimates of effects of cutbacks.)

Almost all the billions voted to Pentagon for defense production have been awarded to industry. Much of the money is not yet obligated in formal contracts. But letters of intent and other informal means of commitment have been freely utilized.

Not until Congress gets around to approving supplemental appropriations for $17 billion will more money be at hand for the armed services to spend.

• • •

Prices are not moving up with the same speed that they did. There is a real slowdown at the wholesale level. Don't look for prices to stay where they are, however. With new wage adjustments coming up, prices can go only one way — up.

The new cost-of-living index of Bureau of Labor Statistics will not be as volatile as the old one. It cuts back the weight of highly seasonal commodities and includes new items more stable in price.

General Motors plans to tie in its wage escalator clauses to the new index. The management is distributing copies to all interested parties.

• • •

It will take freight car builders over two years to work off their backlogs. They have been getting four times the amount of steel this year that they received in 1950.

Home construction starts probably will continue downward, even with better weather coming up. Credit Regulation X is beginning to be felt.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	233.4	236.1	200.7
Steel ingot production (thousand tons)	2,021	2,001	1,821
Electric power output (million kilowatt hours)	6,903	6,795	6,065
Production of automobiles and trucks	177,906	180,577	134,453
Engineering Construction awards. (Eng. News-Record, millions)	$159.8	$220.9	$177.3

QUARTERLY BUSINESS INDICATORS

	Latest Quarter	Preceding Quarter	Year Ago
Gross National Product (billions)*	$300.3	$283.9	$253.8
Expenditures on new plant and equipment (millions)[1]	$4,810	$5,410	$3,700
Profits after taxes in primary iron and steel industry (millions)	$270	$281	$138
Profits after taxes in machinery industry (million)	$271	$265	$181
Profits after taxes in electrical machinery industry (millions)	$180	$144	$ 78
Profits after taxes in motor vehicles and parts industry (millions)	$448	$490	$367
Motors and generators new orders index (1936 = 100)	674	551	236

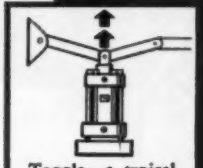
* Seasonally adjusted.

1 Survey of Dept. of Commerce and Securities and Exchange Commission includes commercial.

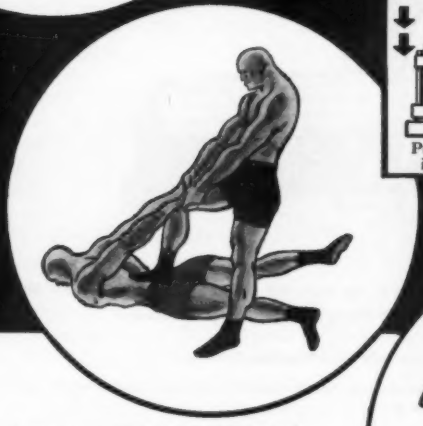
Rasslin' with HIGH COSTS?

SAVE on "MUSCLE JOBS"

with T-J CYLINDERS



Toggle—a typical pushing operation.



Pulling—as shown in 1st class lever.

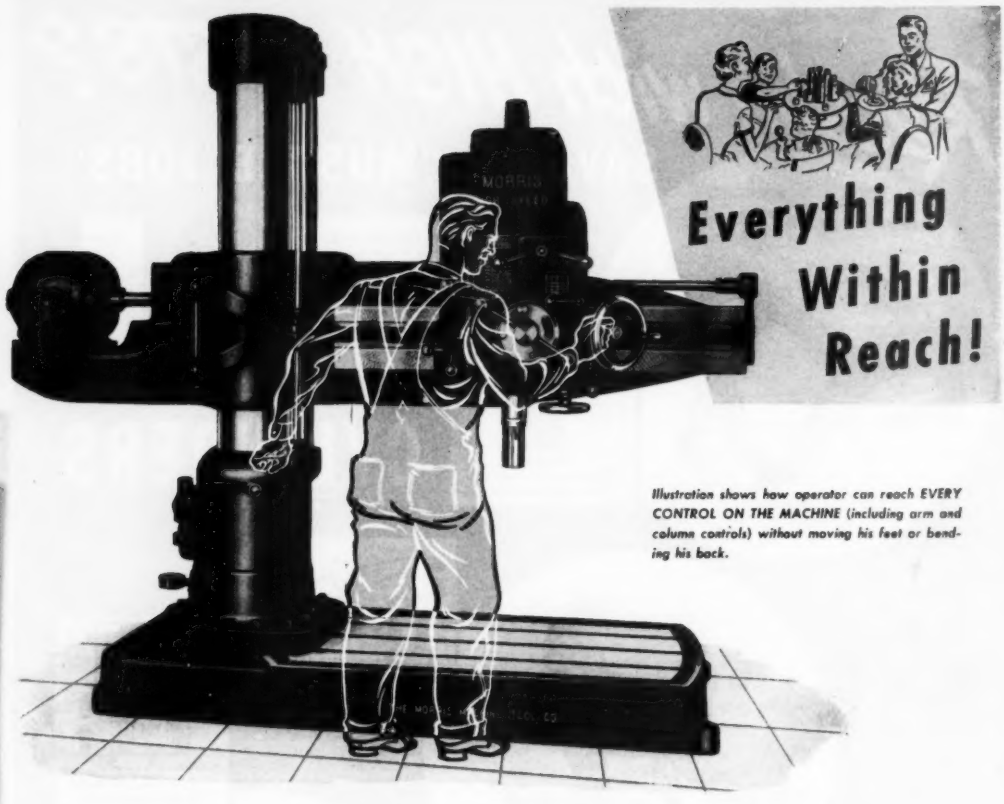
Lifting—a straight thrust movement.

Air or hydraulic power—applied by T-J Cylinders—gets an amazing lot of tough jobs done for industry . . . *faster, more efficiently,* and *at lower cost!* Check your plant operations and machines *now*—make a note of mechanical movements that can be simplified and speeded up with T-J Cylinders! Designed for a wide range of pushing, pulling, lifting, clamping or control jobs . . . 100 lb. or 50,000 lb. Many standard sizes and styles . . . both cushioned and non-cushioned types . . . precision-built, dependable. Write for additional information. The Tomkins-Johnson Co., Jackson, Mich.

35 YEARS EXPERIENCE (T-J)

TOMKINS-JOHNSON

RIVITORS AIR AND HYDRAULIC CYLINDERS CUTTERS CLINCHORS



Everything Within Reach!

Illustration shows how operator can reach EVERY CONTROL ON THE MACHINE (including arm and column controls) without moving his feet or bending his back.

Designed to set a cost-killing pace in the race for profitable production, the MORRIS MOR-SPEED Radial Drill offers a long series of outstanding features:

- **Centralized controls—reduces time between cuts.**
- **Variety of Speeds and Feeds—better selection of the right combination for job at hand.**
- **Automatic Lubrication—prevents damage and saves wear.**
- **Greater strength, rigidity and balance—provides greater machining precision.**
- **More automatic stops—saves time and reduces manual control.**

If you are interested in removing metal faster, with greater precision and at less cost, investigate MORRIS "MOR-SPEED" Radial Drills

Write for copy of new Bulletin #39-A.

THE MORRIS MACHINE TOOL COMPANY

"A better product at less cost— with MORRIS ENGINEERED PRODUCTION"

Builders of MOR-SPEED Line

933 HARRIET STREET CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Are the Cutbacks Necessary?

Are the cutbacks in materials ordered by NPA necessary? This question is being asked daily in the metalworking industries. And it is echoed in Washington, too.

OUR ANSWER IS "No." We might even yield a point and say "Possibly." But on the basis of the evidence at hand, we could not honestly say "Yes."

Remember that there is no substitute for time in tooling up for production. That goes for jet engines, tanks and other defense items more than for automobiles and appliances.

Most defense contracts have been placed since the first of the year. It will take months to translate these contracts into actual production.

It is only recently that machine-tool builders have had much defense business. You must produce and deliver machine tools in large numbers before you can expect to get tanks coming off the line.

MANY STEEL PEOPLE, we are told, cannot figure out how the defense program can absorb the steel tonnage to be released by cutbacks in the second quarter.

Even if you grant that supporting programs — railroad freight cars, oil-well equipment — will require a certain amount of steel, they are not likely to account for a very large chunk of it.

One important industry vitally affected by NPA's ruling has asked repeatedly for specific proof — facts and figures — that the released tonnage will be chewed up. No satisfactory reply has been given.

No one will argue the point that cutbacks should be made if there is a reasonable need for them. We should build up our armament as rapidly as possible.

But only harm can come from slashing civilian usage of materials needlessly. Austerity just for the sake of austerity should have no place in America.

WITH SO MANY SKEPTICS questioning NPA's action, with defense production hardly started, we suggest that NPA furnish a bill of particulars to justify its cutback orders.

That can be done convincingly, if there are real facts at hand, without endangering security. If it is done, it will go a long way toward satisfying those who feel that NPA officials are overeager to exercise the controls now in their hands.

Burnham Finney

contour the special job on a Cincinnati Shaper...at low cost

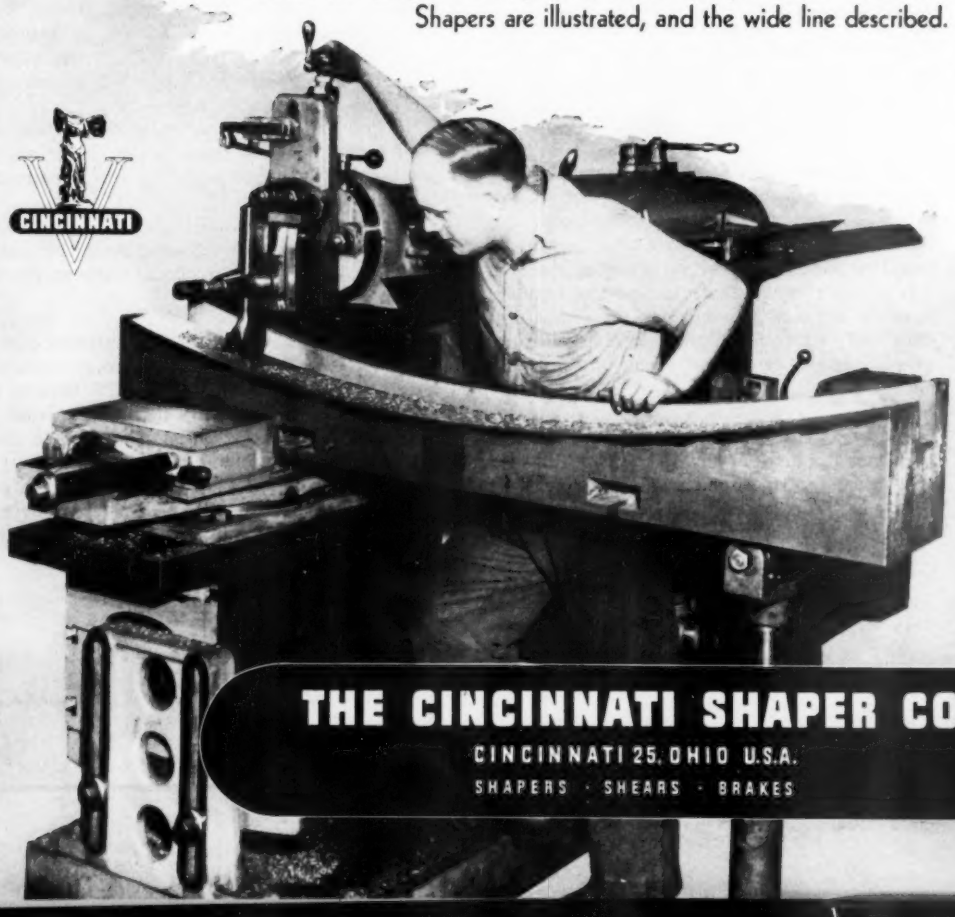
The special job is often a time-eater — and a cost raiser.

This handy Cincinnati Shaper saves time — saves money — on many special jobs. Little time is lost on setups — costly fixtures and special equipment are not needed.

Contouring this 1200-pound tank stave die — roughed and finished in 4 hours — is done at low cost with simple tools and simple setup. It is an example of many jobs performed on versatile Cincinnati Shapers at lowered costs.

Write for Shaper Catalog N-5, where many uses of Cincinnati Shapers are illustrated, and the wide line described.

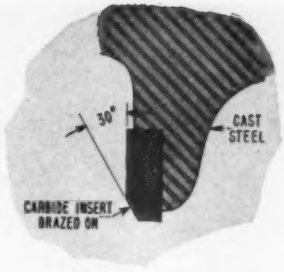
CINCINNATI



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES



HARD STEEL "GRILLED" AT A MILE A MINUTE

Tungsten-carbide bits, brazed to the periphery of a cast-steel wheel and ground with 30° negative rake, running at 6300 sfpm, give ground finish to 52100 steel, brine-quenched

BY DR. J. O. OUTWATER

During the past year and a half, we have suggested that if exact cutters were produced, milling might be done at much higher surface speeds, and that cutting of hardened materials might well prove to be dependent upon instantaneous tool-tip condition. Here Dr. Outwater provides evidence to support both contentions, based on corollary investigations during thesis study on the nature of grinding and its effect on the surface of metals. — E. J. Tangerman

THERE is now only one satisfactory method of machining hardened tool steel: grinding. Hard, heat-resisting tools for turning and drilling are being applied increasingly, but the process is slow and expensive. A cheap, accurate method is still needed.

In careful analysis of the grinding process at MIT last year, it was discovered that the temperature of the metal in contact with the cutting grit is very near the melting point. This high temperature results in softening of the metal in the immediate area, so the effect of any initial hardness is nullified. Forces involved in grinding hardened steel are the same as those in grinding fully annealed metal, which indicates that this analysis is correct.

This high temperature was shown by calculation and experiment to be a direct result of the rapid rate of cutting. Provided cutting speed is sufficiently high, the temperature at the immediate cutting point will be such as to overcome any effects of hardening.

Thus ordinary cutting, if done fast enough, should be satisfactory for hardened metals, provided the tool is of a material with a higher melting point than the metal being cut. The tool must also have good strength without excessive brittleness, as well as being easy to shape. Tungsten carbide was suitable.

Twelve tungsten-carbide teeth were brazed on the periphery of a cast-steel wheel, 8 in. in diameter and rotated at 3000 rpm, giving a surface speed of about 6300 fpm. These teeth were carefully machined to have an equal distance from the axis (see *AM*—Mar. 6, 1950, p 86), to have the same clearance angle of 5°, the same rake angle, and were ½ in. wide. The wheel was supported in the chuck of a surface grinder, and used like a grinding wheel.

The work-piece — of brine-quenched 52100 steel — was supported both on a magnetic chuck and in a small chuck which was itself attached to a force-measuring device to enable comparison between the forces and power consumption of this type of cutting and those of grinding or milling.

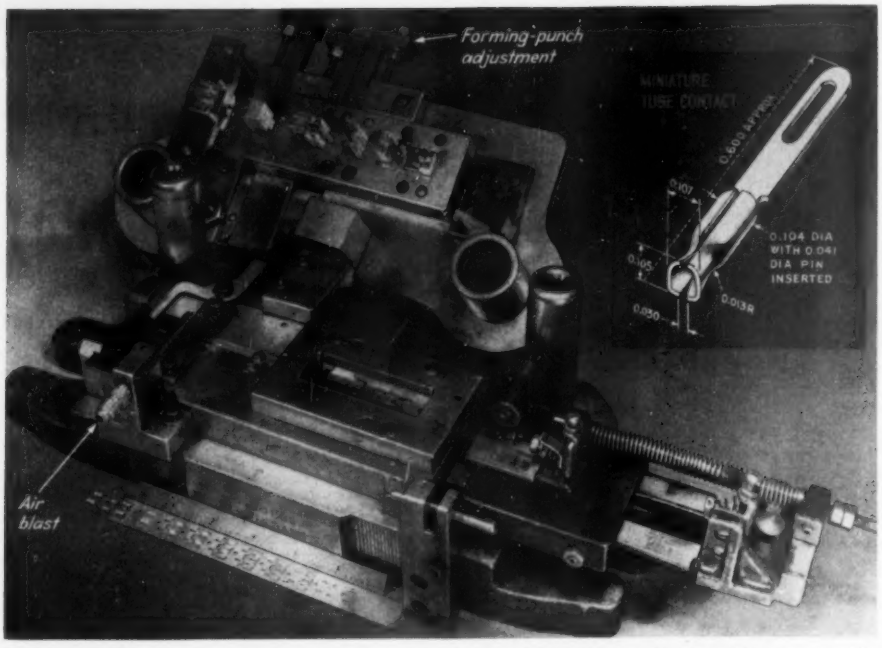
Different table speeds and depths of cut were tried. Three different rake angles, −30°, 0°, and + 30°, were tried to determine the nature of the cutting process.

Relationships between forces, speeds, and feeds were about the same as in grinding. The effect of rake angle was surprising. If a positive rake angle was used, forces involved were high and the surface of the metal appeared torn. With a negative rake, the surface was found to be quite smooth and the forces far lower. The difference in effect was so great that we abandoned what might appear as the more obvious angle; further work was done only on the negative-rake tool.

Cuts up to 1/16 in. deep could be taken with table speeds of 4 fpm, with correspondingly higher table speeds for smaller depths of cut (For another method of milling hardened steel, see *AM*—June 12, 1950, p 94). There appeared to be no reason why an ordinary grinding spindle could not be used, provided the wheel was carefully balanced and the operators trained to stand the noise. This noise proved rather disturbing, but no teeth were chipped or broken in the experiments. There was little tool wear and the brazing stood up satisfactorily. Coolant was found advantageous; it affected the work in the same way as a grinding coolant does.

This process appears to combine the advantages of both grinding and milling, and will probably provide a satisfactory method of machining hardened steel.

Thanks are due Dr. Milton C. Shaw for his helpful advice, and to acknowledge the help of the Timken Roller Bearing Company. Valuable discussion with Dr. J. Rowland and Dr. J. Wulff is gratefully acknowledged.



Forming problem is to hold shape and dimensions of miniature tube contact, so that inserted prong is withdrawn with stipulated pressure. Calibrated wedge movements adjust punch height to suit metal

Progressive Dies Adjust Forming Pressure

Each forming punch is set for height with a screw-operated wedge . . . This feature saves pulling die out of press for adjustments

BY RUPERT LE GRAND, ASSOCIATE EDITOR

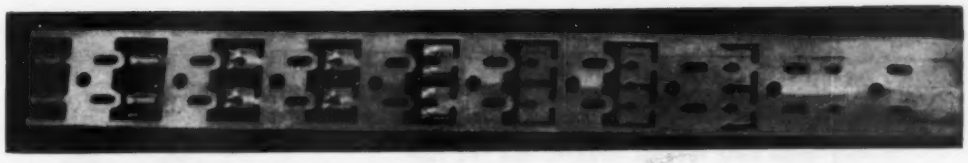
PROGRESSIVE DIES with several forming stations normally require hours of labor to adjust the forming pressure at each operation. The diesetter normally shims the punches according to experience, puts the tool in the press, sees how it operates, then takes out the die, dismantles it and adds or subtracts shims under the punch heads. Eventually, after hours of cut-and-try work, he will get the die to perform satisfactorily.

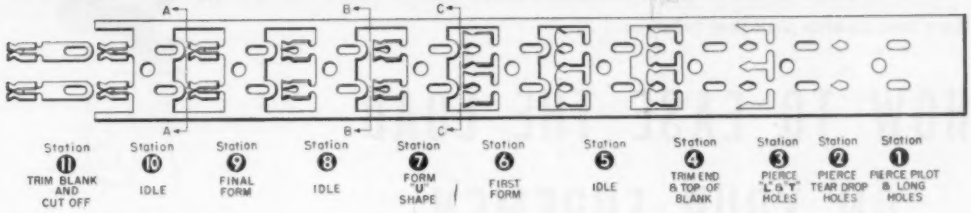
This problem is overcome by John Volkert Metal Stampings, Inc., Queens Village, N. Y., by providing a wedge adjustment to control the height setting of each forming punch. A fixed wedge is fastened to the punch backup member. The sliding wedge, operated by a screw of selected pitch, pushes out the punch as desired. Now, the diesetter puts the die in the press, runs a few pieces, gages them, makes adjustments of punches found to be under or overforming at various stages. Within a half hour at most, he has the die producing to part specifications.

A further advantage of this construction is ability to cope with the forming characteristics of different strip materials, again without taking the die out of the press. The one die makes contacts from brass, phosphor bronze and cadmium-plated beryllium copper. In the last instance, cadmium plating serves as a lubricant, permits 800,000 pc between grinds instead of less than 200,000 pc. About 2,000,000 brass pieces are made between grinds.

Matrix Construction — As the die is made up of numerous small sections, it proved impossible to hold them in place with screws and dowels. Instead, the sections are fitted into a hardened and ground channel. Two endplates clamp all of the die sections in place. The stock guides, which run the entire length of the die, hold the sections down.

The stripper is likewise a channel-shaped plate that incorporates inserts. These are ground with the die sections. This type of die construction is somewhat more costly initially, but it insures that



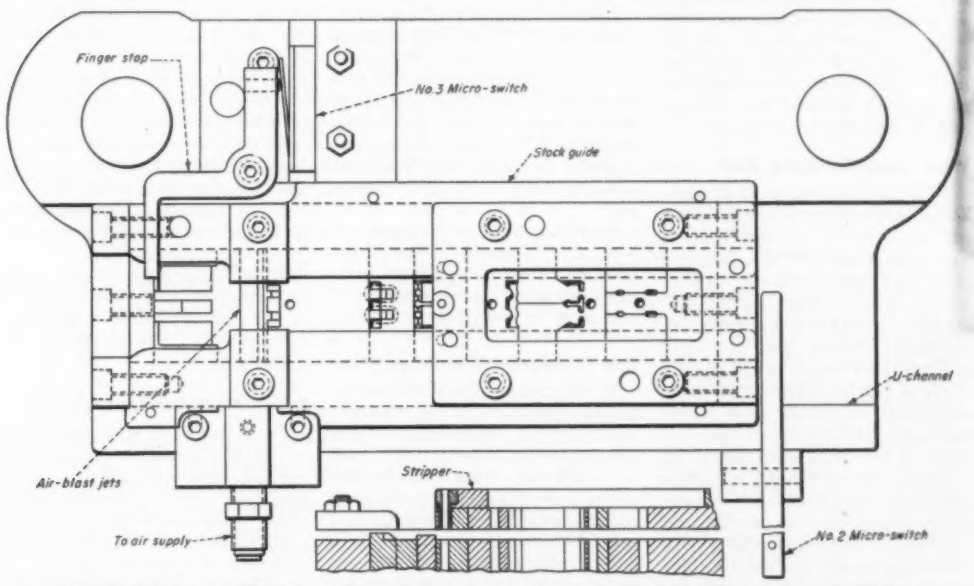

A
B
C
Station 11 TRIM BLANK AND CUT OFF
Station 10 IDLE
Station 9 FINAL FORM
Station 8 IDLE
Station 7 FORM "U" SHAPE
Station 6 FIRST FORM
Station 5 IDLE
Station 4 TRIM END & TOP OF BLANK
Station 3 PIERCE "L & T" HOLES
Station 2 PIERCE TEAR DROP HOLES
Station 1 PIERCE PILOT & LONG HOLES

Contact is entirely preformed — neck, barrel and flared end—while in open position at station 6. Part is then U-ed and finally closed. Shape is controlled by hitting harder or lighter at various forming stages, by adjusting punch heights

die sections and stripper profiles are identical and in alignment. Maintenance is cheaper and easier because worn-out or broken die sections may be replaced readily, since there is no problem of screw or dowel alignment.

Feed Control—The die is fitted with a Dickerman hitch feed. To make sure that short feeding and runing without strip will not occur, three Micro-Switches are wired into the press circuit. The first switch, placed ahead of the Dickerman feed, detects strip exhaustion. The second switch, placed between the feed and the die, detects buckle of the strip. And the third switch operates in conjunction with the finger stop to detect a short feed that would damage the tools. One operator is thus able to handle several like dies.

Part Ejection — The parts are ejected from the die by an air blast from a special twin-jet air nozzle. This nozzle is rotatable and transversely adjustable to insure the air blast being directed at the two parts. The parts are blown into a chute and collected in a removable drawer.



Die assembly consists of inserts held in a channel by end plates and the stock guides. Stripper spans the stock guides and is bolted to them. Inserts in strip and die are ground together for accuracy

If supervisors complain about the personnel department . . .

If they are irked by training duties, suggestions, and so on . . .

If they gripe over records, reports, and red tape . . .

Here is a six-step plan that tells you. . . .

HOW TO EASE THE LOAD ON YOUR FOREMEN

BY EDMUND MOTTERSHEAD

CURRENT DEMANDS for increased production are placing additional burdens on foremen and supervisors throughout industry. New problems of productivity, manpower, and material shortages are adding to the usual crop of supervisory headaches. In this situation, management must see to it that the load does not become too heavy—that the organization is set up to cope with the new problems without undue strain on any one individual. In doing this, one of the most important steps is to check the relationship between the foreman and the personnel department.

What Does Personnel Do?

Basically, the mission of the personnel department is to take work off the shoulders of the foremen and supervisors. It is concerned with the problems of selecting personnel, placing them on the job, training, induction, orientation, personnel control, and personnel welfare. However, most, if not all, of these functions depend for their successful execution upon exact and accurate information received from the operating departments. As a result, the continuing cry from personnel directors for the cooperation of supervisors in carrying out their work translates readily into a demand on the one hand for accurate information, and on the other hand for consistent putting into effect of the plans and programs of the PD.

From the foreman's point of view, there is the complaint that the personnel department is not providing competent workers when vacancies occur. "That silly girl in Johnson's office looks in a book and asks a guy three questions to see if he knows anything and then sends him down to me as a machinist. Why, that fathead doesn't know which end of a wrench to pick up!"

Another frequent grouse concerns the burden of training lately imposed on supervisors. "They send me a bunch of greenhorns that don't know anything and don't want to learn anything and expect me to teach 'em and wet-nurse 'em. I would be better off doing the work myself." (And many of them do).

And then there is the matter of reports . . . records . . . job evaluations . . . rates . . . grievances . . . suggestions . . . safety training . . . and so on.

Top Management Is Responsible

In many cases, the source of the trouble goes right to top management and its organization of the personnel department. Let's look at it this way. Personnel departments have developed in industry for the most part in one of two ways. In one type of situation, the hiring and firing and "personnel" work started out with department heads, supervisors, or superintendents. The burden of this increased until some clerk or stenographer was assigned to handling the application forms, preliminary interviews, and so on. Nine times out of ten the job developed until a personnel department was established, often with the original clerk running the show, still thinking of personnel procedures in the limited terms of his original experience.

The other situation occurred where the top management, tired of the old ways, and tired of having a lot of buck-passing on hiring and firing and grievances from one department to the other, stepped out and hired a personnel director or industrial relations director, set up a department, and sat back in the happy feeling that finally they had someone who could hold all the hot potatoes they had been tossing around amongst themselves.

In either case, although both individuals may have a good grasp of personnel work, there frequently is a tendency among supervisors to resent the "interference" of the outsider.

Takes Work Off Supervisors

Put it this way: When we invent a new machine or develop a new method, the basic purpose is to eliminate jobs, eliminate manpower needs for the particular operation. The basic mission of the personnel department can only be justified if it takes work *off* the shoulders of the supervisors in-

stead of burdening them with more reports and responsibilities. A personnel department is only justified when it can perform its mission as a highly specialized staff department better and more economically than the same mission can be performed by the various department heads.

This principle underlies much of the criticism levelled at PD's by supervisors, and most of the difficulty personnel departments have in getting full cooperation from them. Whether in fact the mission of personnel selection and placement and control is better carried out and more economically performed by the PD is of no consequence. In handling grievances, it is accepted as sound principle that an imaginary grievance must be treated as a real grievance to be eliminated. So, too, the complaints of foremen and supervisors must be treated as real and, in fact, can be taken as the basis for action designed to help the personnel department do a better job for the foreman and thereby increase the over-all effectiveness of the entire organization.

Here Is What to Do

What action should be taken? Much will depend upon individual needs and local circumstances, but the following outline, based upon steps taken by a number of different concerns to meet this problem, may be modified or adapted to suit:

1. Establish *in writing* a definite list of the functions of your personnel department, itemized as to individual tasks involved. (We emphasize the "in writing" simply to bring about the clear thinking that the effort of writing usually demands).

2. Corresponding to this list of functions and tasks, make up another written list of the nature of the information required by the PD to carry out these functions. Add to this a short note in each case as to where and how the information is *at present* obtainable.

3. Look over the information-needed list and sources of information and check each one to see if the same information could possibly be obtained more easily elsewhere.

4. Corresponding again to the list of functions and tasks, make up a third list of the persons who actually carry out the job at the *point of contact with the workers.*

Check Who Does The Work

5. Compare this list with the source-of-information list. It will in many cases be revealed that the source of information and the person responsible for follow-through on the particular personnel function is the same individual. Question at this point: "If the same person must collect information for the PD and carry out the program of the PD . . . is the PD, as such, increasing or decreasing the work load on the supervisor?"

If the personnel department is actually increasing the workload on the supervisor, there is a problem to eliminate unnecessary paper work, reports, and so on. It is, of course, possible that an increased workload on the supervisor in this area may be offset by decreased workload in other areas . . . less waste, and fewer scrap-and-rework - problems through better trained workers, for example; or less lost-time accidents, or fewer grievances; but these compensations must be proved before the added burden of transmitting information to the PD and carrying out a PD-program can be made acceptable to the supervisor.

6. At this point, schedule a series of supervisor conferences, whose objectives should be: (a) simplified personnel procedures; (b) more accurate placement; (c) speedier on-the-job training; (d) reduction of grievances; (e) reduced lost-time accidents; (f) reduced scrap, waste, and rework; (g) reduced maintenance costs; (h) increased production at lower overhead costs. Actually, all six steps can be carried out by the personnel department itself.

Talk the Foreman's Language

It will be noticed that the last few items in this list seem somewhat apart from the normal mission of the personnel department. These last items, however, from a cost standpoint, are the only justification for the existence of the personnel department. The arrangement of the above topics as objectives is intentional. By asking the supervisors how they think personnel procedures can best be simplified, you immediately begin to work on their own complaint . . . overburden of red tape, misplacement of workers, and so on. By talking next about worker training by speedier methods, you again are talking about something that will save the supervisor time, as with the reduction in grievances. By the time you get around to talking about reduced accidents, less scrap, lower costs and higher production, the supervisors are in a better mood to listen to these basic justifications for the function of the personnel department.

The Aim Is Cost Reduction

Many supervisors conceive of the personnel department as something in the front office (i.e., away from reality) which hires and fires, and otherwise bothers them with training programs, movies, safety campaigns, and related stunts. The fact that these varied efforts are aimed at reducing cost is not sufficiently apparent to them.

Consequently, as a conclusion, the experience in many companies would indicate that the soundest method of getting the desired cooperation between supervisors and the personnel department is to ask supervisors for their advice as to how the personnel department can best serve them and make less work for them; and in the process make it clear to them that the over-all results of the efforts of the personnel department are going to be reduced costs, more production, and a lighter burden of supervision for them . . . if they will just, please, give the personnel department the information it asks for and follow through on the latest safety campaign.

GOOD CARBURIZING PRACTICE

XI . . . How to Control Carburizing Equipment

Poor stress distribution within the case and decarburization are among faults to be overcome . . . Accepted methods for determining hardenability of steels and devices for controlling dewpoint of gases are outlined

BY T. A. FRISCHMAN, Chief Metallurgist
AXLE DIVISION, EATON MFG. CO.

DISTRIBUTION and type of stress in a carburized case is important with relation to end use of the product. Use of a low-temperature tempering treatment does not necessarily mean that relative freedom from stress will result.

In general, for small to medium size parts, the hardened, untempered case is in compression. The core in all probability transforms first, the case last. Apparently this is the explanation for the fact that, according to Almen,[1] grinding cracks in carburized parts as a rule do not extend more than 0.010 in. inward from the surface. Their progression to greater depth is prevented by counteracting compressive stresses in the underlying case.

Further support for this contention is found in the greater fatigue resistance of carburized gears as compared to those made of oil-hardened, medium-carbon alloy steel. In the latter, the surface transforms first, so that it is placed in tension by subsequent transformation expansion of the interior.

A tempering treatment may be essential in order to stabilize the case or to toughen it, or perhaps to overcome grinding problems. Yet, there is no certainty that the direction of stress will not be reversed, so that increased stress results instead of a beneficial reduction in stress. Safest method of determining whether to temper carburized parts lies in trial and error experiments.

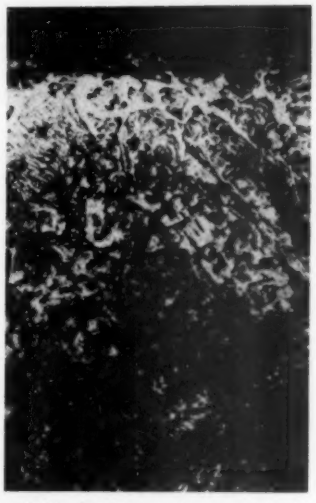
Decarburization

Partial loss of surface carbon is not important if the grinding stock exceeds the decarburized layer. In gearing, however, decarburization cannot be tolerated because only a few tenths are removed by laps.

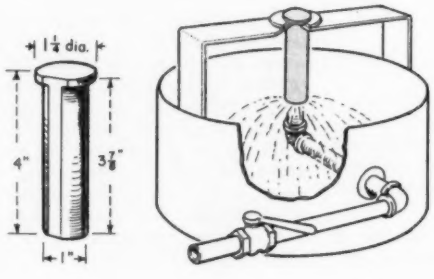
Decarburization results during: (1) slow cooling, at around 1400 F, after carburizing, (2) reheating for hardening, and (3) the latter part of the carburizing process if air infiltrates the furnace and causes formation of water vapor.

To circumvent decarburization, maintain the furnace and its appurtenances in good working order, and keep carburizing mediums at higher efficiency. Direct quenching from the carburizer is the best means to avoid decarburization, but even here all factors must be properly controlled.

Low Rockwell hardness readings may confuse the operator.



Slight decarburization of direct-quenched SAE 8620 steel is revealed by microscope examination. First 0.001 in. or so below surface (white layer) is decarburized extensively as revealed by visible free ferrite. Total depth of decarburization, 0.004 in. Magnification, 500X



Hardenability tests on alloy constructional steels are made by directing a water spray on the end of a specimen heated to a specified temperature above the transformation range

[1] *J. O. Almen in a lecture before the Cleveland Chapter, American Society for Metals.*

Wilson Mechanical Instrument Co.
Hardness determinations on quenched Jominy specimens are best made while properly supported in a device like the "Equitron" fixture. The device provides means for accurately positioning the sample for successive Rockwell tests at 1/16-in. intervals

They are produced by either decarburization of the surface layer or the presence of too much retained austenite. To distinguish between these two causes, reharden the workpiece. If the desired hardness is now produced, retained austenite was probably the cause of the original softness. On the other hand, the rehardened part will still be soft on the surface if decarburization is present. Another test is the use of a new, sharp file. This tool will cut decarburized, hardened case but not the other. If still in doubt, examine the microconstituents under the microscope to reveal their nature and interpret the trouble.

Control of Carburizing

To avoid trouble from manufacture or service of a part, it is best to institute control measures as early as possible. Inform the steel mill of the quality and characteristics desired by means of a specification worded as simply as possible. Cover the scope of intended use, plus the chemical analysis, grain size, hardenability, sample requirements, identification methods. If the purchaser checks incoming material, he may run a partial or complete chemical analysis or have this done for him by a commercial laboratory. Or he may depend upon a hardenability check. For best results a hardenability test should be made when the steel is used for an important part.

The hardenability test accepted as standard by the SAE and the ASTM is the end-quench test devised by Jominy and Boegehold.[2] In its present state of development, this test is confined primarily to alloy construction steels. By employing the end-quench test, one may predict the response of such steels to various heat-treatments. For example, one may learn the hardness obtainable over a wide range of cooling rates, extending from air cooling to the best commercial water-quenching treatment. Core hardness of carburized and hardened parts may be predicted. Also revealed are the air-hardening tendencies of a steel, thus aiding in selection of the best heat-treatment for good machinability.

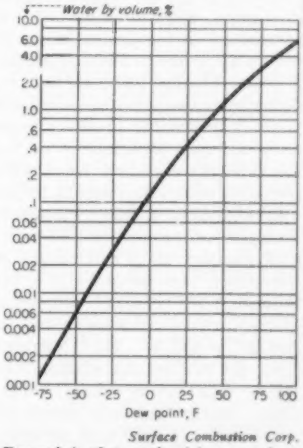
The test consists of water quenching one end of a cylindrical piece 1 in. dia by 4 in. long, a flange supporting the bar over a water-spray orifice. After the specimen has cooled, two parallel flats 0.015 in. deep are ground 180° apart, preferably for the entire length. Rockwell hardness determinations are made 1/16 in. apart for the first inch and in larger steps thereafter.

With the end-quench test it is possible to know in advance the final core hardness that should be obtained in a part, if the severity of quenching method is known. Hardness readings obtained along the test specimen can be correlated with the mass or bar size having equivalent cooling rates. The accompanying table illustrates this point. Data are given for three steels. With a very good quench, of Grossman severity $H = 0.50$ as compared with the test method, the core of a 1-in. round will have the same Rockwell hardness as at the 5/16-in. position from the quenched end of the 1-in. dia test specimen.

By using Grossman's values for severity of quenching and periodic hardenability tests on specimens of material, it is possible to control heat-treating according to the results desired. For example: the product is made from a 3¼-in. bar of SAE 4817H steel which is given a very good water quench of a severity $H = 1.50$. The core hardness should be Rockwell C 24. If the end-quench test specimen does not yield this hardness value at a distance 12/16 in. from the end, the heat of steel does not possess the desired hardening qualities. To use the steel and obtain the wanted hardness, a faster quench is necessary, such as extremely violent agitation or, as a last resort, a brine quench.

Another factor in the control scheme is to test various materials that are used in carrying out the carburizing process. For instance, incoming shipments of carburizing compound can be checked for weight, shrinkage, particle size and carburizing activity. The check might also be extended to cover analysis of the percentages of energizers, although this is hardly necessary today for compounds furnished by reputable makers. Liquid carburizers should be checked at least semi-weekly for cyanide content, and more frequently if salt additions are not made on a regular schedule.

Carrier-gas generators and gas-carburizing furnaces should be checked for gas composition and dew point on a schedule worked out for plant conditions. With large continuous furnaces samples of the

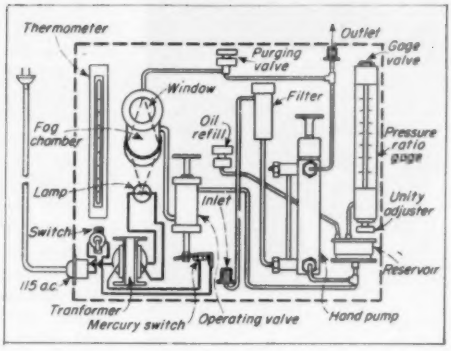


Surface Combustion Corp.
Dewpoint of a carburizing gas is a measure of its carbon potential. Here dewpoint is shown to be a function of percentage of water vapor in the gas by volume

[2] *"A Hardenability Test for Carburized Steels" by W. E. Jominy and A. L. Boegehold—*

Portability and easy use enable the "Alnor" dewpoint apparatus to be used anywhere in the heat-treating department. Samples of gas are compressed and expanded until fogging of the gas in the chamber occurs

Illinois Testing Labs., Inc.



carburizing gas may be obtained from the chamber by suitable access through the side of the furnace, or may be taken from the effluent or outlet pipe. Usually the effluent-gas composition is lower in methane content than in the furnace chamber where the fresh gas is being introduced. Power-driven fans will help to mix the gas throughout the furnace.

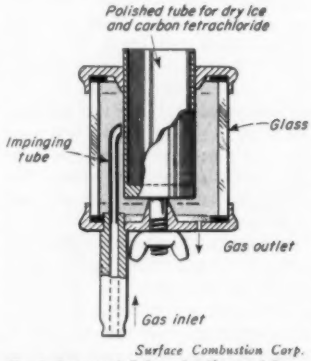
Checking of gas composition can be done as often as deemed necessary: hourly, daily, semi-weekly or weekly, depending upon individual plant conditions. Too long an interim between checking may permit trouble to develop because of undetected changes in gas composition. It is a good plan to make dew-point determinations of the carrier gas at the generators on at least a daily basis. This suggestion is made because some of the endothermic-type generators require slight adjustments in the air-gas ratio as soot accumulates in the gas-cracking chamber. By making frequent, small adjustments, larger and unpredictable ones are avoided.

Control of the dewpoint, or moisture content, of a carrier gas is important, because there is a relationship between the dew point of the furnace atmosphere and its carbon potential. As dewpoint rises, the carburizing medium becomes less active, other things being equal. An accompanying curve shows the per cent of water vapor by volume with respect to dewpoint. This curve gives an idea of the amount of moisture present when dewpoints are maintained within the customary range for gas carburizing. This range generally extends from zero to + 25 F.

Measurement of Dewpoint

Dewpoint of a gas may be measured in several ways. A simple apparatus is the dewpoint cup, which is used mostly when frequent determinations are not made and the expense of elaborate equipment is not justified. The method is time consuming and requires dry ice.

Another dewpoint checker now becoming more widely used in gas carburizing is one that shows the fogging point of the gas upon its expansion in a chamber. Successive samples of the gas are compressed and expanded until fog particles appear, which indicate the dewpoint of the gas. This portable apparatus is handy in use and can be operated by unskilled men.



Surface Combustion Corp.

For infrequent determinations of dewpoint, the simple dry-ice cooled cup is sufficient. Dewpoint of the gas is the temperature at which the polished tube is fogged.

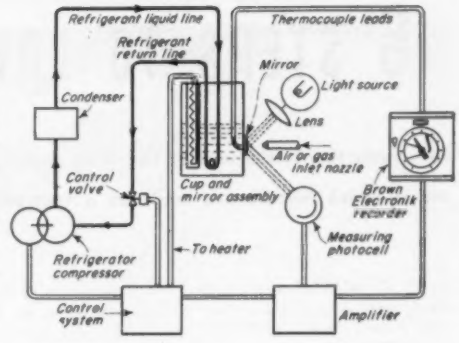
Where dewpoints must be continuously measured and recorded, a dewpoint recorder is desirable. If more than one atmosphere requires checking, an atmosphere selector is used in connection with the equipment. As many as six different atmospheres can be checked and recorded.

Operation of the dewpoint recorder is: A beam of light is focused on the mirror at a slight angle by a lens. The reflected beam is intercepted by a photocell which measures the amount of light it receives. A jet of the atmosphere being tested is directed against the mirror, which is actually a part of of the surface of an evaporator (dewpoint) cup within which a refrigerant is circulated. As the temperature of the refrigerant drops, the mirror temperature decreases at a controlled rate until a fog forms on the mirror due to the condensation of moisture in the gas under test. When the dewpoint is thus reached and the mirror becomes fogged, the amount of light reflected by the mirror to the photocell causes a record to be made of the temperature of the mirror.

Measurement of gas dewpoint alone does not tell the entire story, especially when troubles in gas carburizing arise. As a rule where good control is exercised in gas carburizing, the carrier gas and the gaseous carburizing mixture in the chamber are both checked for specific gas constituents. These are carbon dioxide (CO_2), carbon

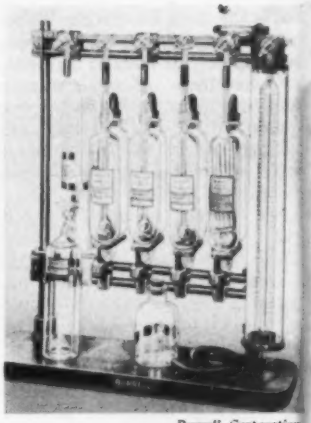
Continuous recording of dewpoint is desired on large gas furnaces where a change in carbon potential of the carrier gas would produce off-specification cases. With an atmosphere selector in addition, the furnace operator can keep track of conditions at several furnaces

Surface Combustion Corp.



monoxide (CO), oxygen (O_2), methane (CH_4) and hydrogen (H_2). Determination of these constituents is made with a gas-analysis apparatus. Briefly, the principle of the method is to pass a known volume of gas through different towers or pipettes containing chemical solutions that each absorb a specific constituent. The gas is passed back and forth between each pipette and the measuring burette until a constant contraction in volume is obtained. Percentage of each constituent can then be calculated, using the contractions in volume as read from the measuring burette. This instrument has the advantages that it is portable.

It might seem superfluous to mention pyrometry as one of the factors entering into control of carburizing. Nevertheless, its importance is so obvious that it might be overlooked. Exact control of temperature is important, because a 25 F error in furnace temperature means a great deal in the results produced at 1700 F and higher. Temperature change has a marked effect on the rate of diffusion and solubility of carbon in austenite. Every precaution should be taken to place thermocouples in the correct locations, so that actual temperatures of work pieces are recorded. All components of the temperature-measuring system from thermocouple to instrument should be carefully serviced and checked periodically.



Burrell Corporation

Gas analysis is a necessary adjunct of really good control of large gas-carburizing operations. A known volume of gas is passed through chemical absorbents in sequence, and the volume shrinkage at each step represents a specific constituent in per cent

HARDENABILITY READINGS on Typical Carburizing Steels and Quenched Rounds with Equivalent Core Hardness

	TYPE OF STEEL				
	SAE 8620H Heat Analysis	SAE 4620H Heat Analysis	SAE 4817H Heat Analysis	Diam. of Round (in.) Having Equivalent Hardness at Center*	
% C	0.21	0.19	0.16		
% Mn	0.75	0.50	0.52		
% Ni	0.59	1.75	3.56		
% Cr	0.50	—	—		
% Mo	0.18	0.23	0.23		
Distance from Quenched End 16ths	Rockwell C	Rockwell C	Rockwell C	H = 1.50a	H = 0.50b
1	45	43	45	0.50	0.25
2	42	40	44	0.82	0.43
3	37	33	42	1.10	0.62
4	30	30	40	1.37	0.81
5	27	25	38	1.62	1.00
6	26	22	35	1.87	1.18
7	24	21	32	2.12	1.41
8	23	21	30	2.37	1.58
10	22	18	27	2.81	1.96
12	21	17	24	3.25	2.34
14	19	16	22	3.62	2.71
16	18	16	21	3.98	3.06
20	17	15	19	4.56	3.64
24	16	14	18	5.06	4.10
28	15	12	18	5.42	4.45
32	15	11	17	5.73	4.75

* *Data from U.S.S. Carilloy Steels, 1948, p42, United States Steel Company, Pittsburgh*

a Grossman's severity for a very good water quench.

b Grossman's severity for a very good oil quench.

The concluding installment of "Good Carburizing Practice" will appear in the April 16 number.

6 STEPS TO LOWER LAYOUT COSTS

90% reduction in the cost of obtaining completed layout prints results from a new process in which layouts are made on a transparent plastic film. Here is how it is done

BY C. G. WALLIS, Manager
Headquarters Mfg. Division
WESTINGHOUSE ELECTRIC CORP.
PITTSBURGH, PA.

A NEW method for developing templet plant layouts eliminates the need for tracings to obtain working prints of the approved layout and cuts costs to a fraction of what they are when tracings must be made. The new method employs a transparent plastic film to which templets are attached with a non-hardening adhesive. Prints of excellent quality are made directly from the layout either by the photo-reflex process or by running the layout through a conventional black and white printing machine. With this method, the cost of obtaining completed layout prints is reduced 90%.

Developed in the Manufacturing Analysis and Planning Section by A. N. Evans under the direction of J. I. Webb, section engineer, the new process has been incorporated into a complete new layout procedure that involves six steps:

Step 1: Produce cross-section lines on a transparent film.

A sheet of ¼-in. cross-section paper is placed in contact with the glossy sensitized side of a sheet of Bruning film and both are passed through a blueprint machine in the usual way. The ¼-in. cross lines are reproduced on the film and permanently establish a visual scale for layout work.

Step 2: Draw the physical outlines of the building directly on the film.

The plan view of the buildings is drawn directly on the matte side of the film, which takes ink and pencil easily. Once this is done, the film becomes a permanent blank panel and does not require redrawing at any future stage of development. It provides the background for the original and final layout and takes the place of prints and tracings. Except for incidental drafting during layout no further drawing is necessary.

Step 3: Mount the film on a photographer's mounting board.

The blank panel now is mounted on a photographer's mounting board and is trimmed to match lines. Templets then can be attached directly to the film.

Unlike paper backgrounds, which frequently are replaced several times before the layout is developed completely, the film has a hard, durable surface that withstands considerable abuse. Changes in the building outlines can be made with a special eradicator or, if the film is dampened with water, by scraping with a knife.

Step 4: Attach templets directly to the film.

Double-coated adhesive tape is applied to the back of templets before they are cut out. The outer covering is removed when the templet is ready for attachment. The tape adheres to the film evenly, and will last indefinitely if lifted with a small putty knife or similar tool.

As movable paper templets are the simplest and most economical way to represent the scaled plan outline of equipment, printed templets are stocked. Templets for standard machine tools, material-handling devices, and office furniture are printed on 8¼ × 11-in. sheets in salmon, yellow, green, or pink. These are standard layout colors. Salmon is for machine tools, yellow for conveyors, pink for other material-handling devices, and green for office furniture, work benches, lockers, bins, and racks. Opaque colors, such as deep blue and red, do not register satisfactorily in direct reproduction and should be avoided. Pastel shades containing some yellow produce the best results.

When a complete layout has been developed on the film, it is presented, as is, for approval. After installation, it becomes the permanent record of the arrangement.

Step 5: Reproduce the layout directly from the film.

This can be done in either of two ways. Originally reproductions were made only by the photo-reflex process. Now, however, a special paper, Kodagraph Autopositive Extra Thin, makes possible production of reflex-photo-copies on a black and white printing machine.

In the first process, a negative is made from the original layout and a positive is produced on transparent paper from the negative. These transparencies are sharp in outline and contrasting values and prints in unlimited quantities can be made from them.

The procedure in the second method differs only slightly from that of the first method. As material passing through a black and white machine must be flexible to pass over the rolls, the film is not mounted on a photographer's mounting board. Because of this, individual panels are not as rigid and require more care in handling.

Reproduction is similar, consisting of exposure, developing, fixing, and washing. However, as the Autopositive paper is thin, the reverse negative serves as a tracing

to produce black and white prints, thereby eliminating the step of making a positive for this purpose.

In this way, the slow and expensive job of preparing layout drawings, has been eliminated. Previously, each panel had to be redrawn to agree exactly with the approved layout—a process that frequently required one or two days for a 24 × 36-in. drawing and could take several weeks for a job involving many drawings.

With the new method, prints are available almost immediately as no redrawing is required. Another major advantage is this: Because many of the incidental phases of layout practice are dispensed with, the layout engineer is free for the more important phase of his activity—manufacturing analysis.

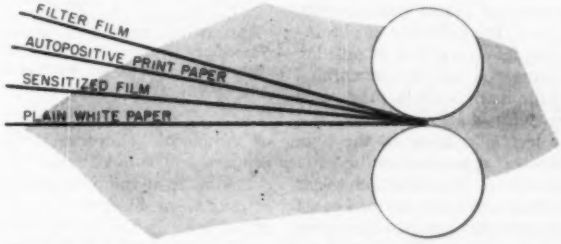
Step 6: Plan plant layouts according to a Key Plan system.

Layout sheets of standard dimensions are much more desirable than sheets of odd sizes to suit a particular area. Difficulties in filing tracings and drawings of different dimension are eliminated.

The new film conforms to a standard panel size of 24 × 36 in. and supplements the Key Plan system of layout. In this system, a surveyor's plot plan of a specific plant site is obtained. The location of all buildings is shown. The plot plan then is divided into uniform subdivisions with maximum dimension of 82 × 132 ft when the scale is ¼ in. to the foot. Each sub-division is given a consecutive number beginning with one, and is identified as a panel. A prefix *P* denotes proposed, *E* means existing. Thus, *P1-1* denotes panel one on the first floor, while *P1-2* identifies panel one on the second floor. When the number of panels in a layout is known, another figure is added to the panel number. For example, proposed layout panel number one, first floor, one of a set of nine panels, is *P1-1-9*. When the layout is installed, the prefix is changed from *P* to *E*, meaning existing. The boundary lines of adjacent panels become match lines. These can be mounted on a wall as a complete layout available for ready reference.

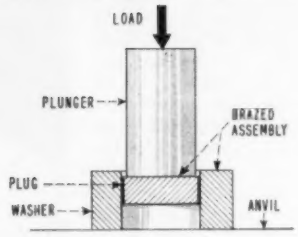
Transparent plastic film forms background to which templets are attached. Layout is taken to . . .

. . . **Standard black and white** printing machine where layout is run through in contact with sensitized paper. Resulting reflex-photo-copy then can be used to produce working prints. Sketch below shows



. . . **Production of reflex-photo-copies.** Autopositive paper is in contact with layout (3rd sheet from top). Light passes through filter and print is made through base of paper which is exposed by light reflected from plain white sheet of paper at bottom beneath layout

IS FURNACE BRAZING JUST AS GOOD?



Shear strength of brazed plug and washer samples was tested by inserting a plunger of a slightly smaller diameter into the hole, then applying load to the plug until failure occurred. Results obtained from testing a number of samples were averaged to obtain the results shown in Table II

Yes—according to exhaustive tests with a variety of brazing alloys on copper, brass and steel . . . they indicate that furnace brazing will produce a shear strength at least as high as with other brazing methods

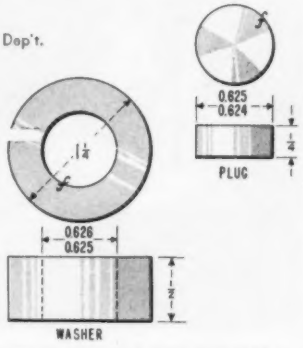
BY SAMUEL DAMON

Metallurgical Engineer, Materials Engineering Dep't. Westinghouse Electric Corp.

TESTS made on carefully prepared copper, brass and steel samples show that furnace-brazed joints are at least equal in shear strength to those brazed by other methods. These tests were carried out in the metallurgical laboratory of the Westinghouse Materials Engineering Dept., using the samples shown in the accompanying sketch.

Some thought was given to the type of sample which would most satisfactorily serve in furnishing true shear-strength values. Simple lap joining of plates was rejected, because of the difficulty of obtaining axial loading either in pushing or pulling the sample. Machining of tensile bars with a plug and socket joint was considered, but was rejected in favor of the plug and washer type of assembly.

Reasons for this selection were: 1) The application of the load could be concentrated almost entirely on the joint itself. 2) The disturbing influence of low yield strengths in the components of the assembly would be minimized. 3) This type of sample is relatively simple to prepare and is low in cost.



Plugs and washers were machined to dimensions shown from copper, brass and steel bar stock. Bore of washers and OD of plugs were controlled to allow clearance of about 0.001 in. on dia. This permitted assembly without pressure and insured sufficient space for free flow of brazing alloy

Diameter of the hole and length of plug were selected to give ½ sq in. of area in the joint, with approximately 0.001-in. clearance on the diameter. This permitted assembly of the parts without pressure, thus reduced the possibility of a frictional component entering into the values obtained. At the same time, sufficient spacing was incorporated to permit free flow of the brazing alloys. Because the strength of a brazed joint falls off rapidly with increasing clearance, careful control of clearance in the assembled samples was considered essential to accuracy of the results.

Materials in sample assemblies are listed in Table I, as are brazing materials employed. Plugs were finished with a fine machined surface, and washers were reamed to reduce the possible effect of variations in surface finish. Each sample was degreased thoroughly before assembly.

Flux was painted smoothly on the mating surfaces of nonferrous assemblies and on the ring of brazing material. The ring was 1/32-in. wire, except for the Phos-Copper, where one-third of a ring of 1/16-in. wire was employed.

Brazing operations were carried out in a brick-lined box pusher-type furnace with an atmosphere of 6:1 Exogas (13% H_2, 11% CO, 5% CO_2, 0.5% CH_4, balance N_2). Sample loading on the furnace trays gave rapid and uniform heating with a standard cycle of 20

Table I: MATERIALS USED IN SHEAR STRENGTH TESTS

MATERIALS BRAZED:

Copper—Tough pitch copper: 99.9 Cu.
Brass—Free cutting brass: 60-63 Cu, 2.5-3.7 Pb, Remainder Zn.
Steel—SAE 1111.

BRAZING MATERIALS:

High-Copper Brazing Alloys:
(A)—80 Cu, 15 Ag, 5 P.
(B)—93$_4$ Cu, 7 P. (Westinghouse "Phos-Copper" brazing alloy)
Copper Wire—Used for brazing steel only.

Silver Brazing Alloys:
(C)—50 Ag, 15.5 Cu, 16.5 Zn, 18 Cd.
(D)50 Ag, 34 Cu, 16 Zn.

Table II: AVERAGE SHEAR STRENGTH OF FURNACE-BRAZED JOINTS

Material Brazed	Brazing Material	Brazing Temperature	Aver. Shear Strength (Psi)
Copper	(A)	800 C	18,600
Copper	(B)	800 C	18,350
Copper	(C)	700 C	12,900
Copper	(D)	820 C	14,360
Brass	(A)	800 C	22,140
Brass	(B)	800 C	23,500
Brass	(C)	700 C	16,420
Brass	(D)	820 C	24,100
Steel	(C)	700 C	25,300
Steel	Copper Wire	1,100 C	47,100

NOTE: *Low values obtained for (C) brazing material in the case of copper and brass probably resulted from a lack of adequate penetration, due possibly to reduced fluidity at the brazing temperature (700 C) employed.*

min. in the hot zone. After 25 to 30 min. in the cooling chamber of the furnace, the assemblies were removed, and those on which flux had been used were washed in boiling water to remove the flux residue.

Testing was accomplished by inserting a plunger of a slightly smaller diameter into the hole and applying load to the plug until failure occurred.

Average values obtained from these tests are shown in Table II. In most cases it was difficult to estimate what percentage of the area of the joint had been wet, because smearing of the brazing alloy occurred as a result of friction between the brazed surfaces after failure. In almost every case the copper samples failed by shearing of the copper itself, rather than by failure of the filler metal.

Although results of the tests on copper-brazed samples are unusually high, this is believed to be simply a resultant of the close control exercised over the fit, and the elimination of interfering effects from possible off-center loading, or to local yield of the base metal in other types of test samples.

Results in Table II indicate that shear strength of a joint made with a given filler material depends to some extent upon the strength of the parent metal, as indicated by the increase in strength revealed in going from copper to brass, and finally to steel, for the base material.

Additional tests made with joints brazed with Phos-Copper show only limited changes resulting from variations of brazing temperature between 730 and 810 C. Highest results on copper assemblies were achieved without the use of flux, and in the upper temperature range. Joints in copper-base alloys, although less sensitive to temperature, require a flux to obtain adequate flow of the brazing alloy, and develop highest strength when brazed in the lower temperature range.

For these tests, pins in the test assemblies were 6 in. long, and one end was ground for a length of about ½ in. to 0.4980 plus or minus 0.0005 in. The hole in the washer was reamed to 0.4990 plus or minus 0.0005 in., providing a 0 to 0.002-in. clearance.

Testing was done in a ½-in. bolt testing fixture, with the washer on the shoulder of the top fixture and the pin held by the jaws of the bottom grip. The pin was pulled until failure occurred. Samples were made up by selecting a pin and washer which gave a clearance of 0.001 in. approx. Those to be brazed with flux were painted with flux before assembly. A ring of 1/16-in. Phos-Copper wire was placed at the joint, and where flux was used the ring was also painted with flux.

Previous experience had already shown that Phos-Copper joints in copper usually failed in the parent metal adjacent to the braze. To make sure, therefore, that failure would occur in the braze, samples of silicon bronze (2.3-3 Si, 0.3-0.7 Fe, 2.5-4.5 Zn, remainder Cu) were made up and tested along with samples of tough pitch copper (99.9 Cu).

A fixture was made to hold parts upright in the furnace, so brazing alloy could flow into the joints without interference. Treatment time was 15 min. at each temperature in a pusher-type furnace with a 6:1 Exogas atmosphere. Use of

Table III: SHEAR STRENGTH OF PHOS-COPPER BRAZED JOINTS

Brazing Temp. Deg C	Copper		Silicon Bronze
	without flux	with flux	with flux
730	10,350	10,910	14,590
730	10,460	10,920	15,560
730	10,460	10,940	16,730
730	10,510	11,300	17,550
730	11,020	11,730	17,880
730	11,220	12,750	17,900
730	11,730	12,960	18,260
730	12,960	13,190	18,470
730	12,960	13,210	18,620
			19,380
730 —Aver.	11,300	12,000	17,500
775	10,350	9,840	11,990
775	10,380	10,000	12,390
775	10,560	10,200	12,500
775	10,560	10,510	13,930
775	11,530	10,660	13,980
775	12,240	10,760	14,030
775	12,600	10,860	14,690
775	13,060	10,860	17,170
775	13,670	11,370	17,450
775		13,030	
775		14,670	
775 —Aver.	11,650	11,160	14,200
810	11,990	9,790	12,500
810	12,170	10,000	12,850
810	12,620	10,070	14,280
810	13,160	10,120	14,560
810	13,370	10,460	14,590
810	13,980	10,470	14,590
810	14,380	10,710	15,050
810	14,460	11,530	16,120
810	14,640	12,000	16,990
810		12,400	17,500
810		12,950	19,600
810 —Aver.	13,400	11,000	15,900

NOTE: *All values are given in pounds per square inch (psi).*

flux was found to be mandatory on silicon bronze, which contains oxidizable constituents, as the brazing alloy would not melt on unfluxed samples at any of the three temperatures employed, or at least would not wet properly. With copper, it would appear that some interference to the flow of Phos-Copper occurs if a flux is employed, thus lowering joint strength. Moreover, the appearance of the joint is improved when flux is not used.

A further indication seems to be that maximum strength will be derived from Phos-Copper joints if base materials of higher yield and tensile strength than copper are employed. In any case, joint strengths developed in copper assemblies are of the same order as the shear strength of annealed copper.

This is understandable, because every copper test sample failed in the base metal rather than in the braze, indicating the shear strengths obtained to be those of the parent metal, rather than of the joint. With silicon bronze, all failures occurred in the joint material, and these results are considered more indicative of the actual joint strength.

As shown in Table III, the results indicate that with ordinary copper or copper alloys which do not contain oxidizable elements, brazing can be carried out at temperatures down to 730 C. Better results, however, were obtained at 810 C, possibly because of better penetration due to heightened fluidity of the brazing material.

RESULTS OF PHOS-COPPER BRAZING TESTS

Results of the experiments outlined suggest the following conclusions:

1) Copper-to-copper furnace-brazed joints of Phos-Copper alloy made without flux in a 6:1 Exogas atmosphere show better penetration and filleting than those made with flux.

2) Such joints show higher breaking strength when brazing temperatures are in the vicinity of 810 C.

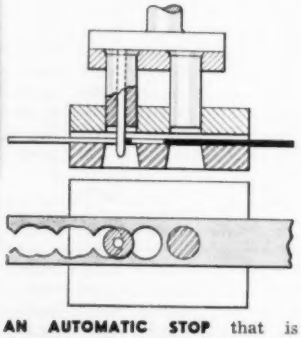
3) Phos-Copper joints made in higher strength copper alloy base materials will develop higher strength than those in copper.

4) Brazing of copper alloy base materials with Phos-Copper will require a flux; otherwise, the oxidizable constitutents in the copper alloy will usually prevent the brazing material from melting and wetting properly.

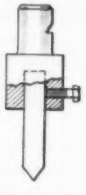
5) Higher strength joints with copper base alloys result from brazing at temperatures around 730 C.

DIEMAKER'S KINKS

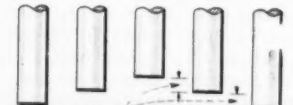
BY FEDERICO STRASSER



AN AUTOMATIC STOP that is cheaply made for blanking dies is composed of two parts: a round punch and a drill-rod core. The stock feeds forward until the scrap bridge strikes the drill rod core. Then, when the ram descends, the punch portion of the stop blanks the web, permitting another advance of the strip. An automatic stop of this type requires finger stops for starting the strip.

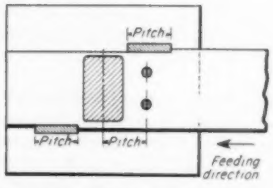


PUNCH HOLDERS with round shanks to fit the press ram are a convenience when using bending or forming punches. The latter are usually rectangular blocks, and obviously it is expensive and time-consuming to make these parts with round shanks.



MULTIPLE PUNCHES are usually of staggered height to reduce the load on the press, but the difference in height should not equal the stock thickness, as is commonly supposed.

Penetration necessary to sever the slug ranges from 37 to 67% of stock thickness, when t = 3/32 to ½ in. Jerky punching action is avoided if the punch-height difference does not greatly exceed those values. It is convenient to locate the longest punches near the outer ends of the punch assembly.



AN AUTOMATIC STOP for thin materials, and especially uneven-width strip, consists of a notching punch of the same width as the pitch of strip advance. Thus, strip advance is automatically of the correct amount. A second notching punch at opposite side and other end of tool equalizes the cutting pressure and permits use of the last piece of the strip. Kinks like these enable the diemaker to get the most out of the strip and to avoid poor parts.

KNOW YOUR Measuring Tools

BY H. E. LINSLEY
ASSOCIATE EDITOR

All metalworking operations involving a change in the shape of a workpiece necessarily require that certain measurements be taken. These may be exact to a tenth of a thousandth, or merely approximate, but there must be some means of making them.

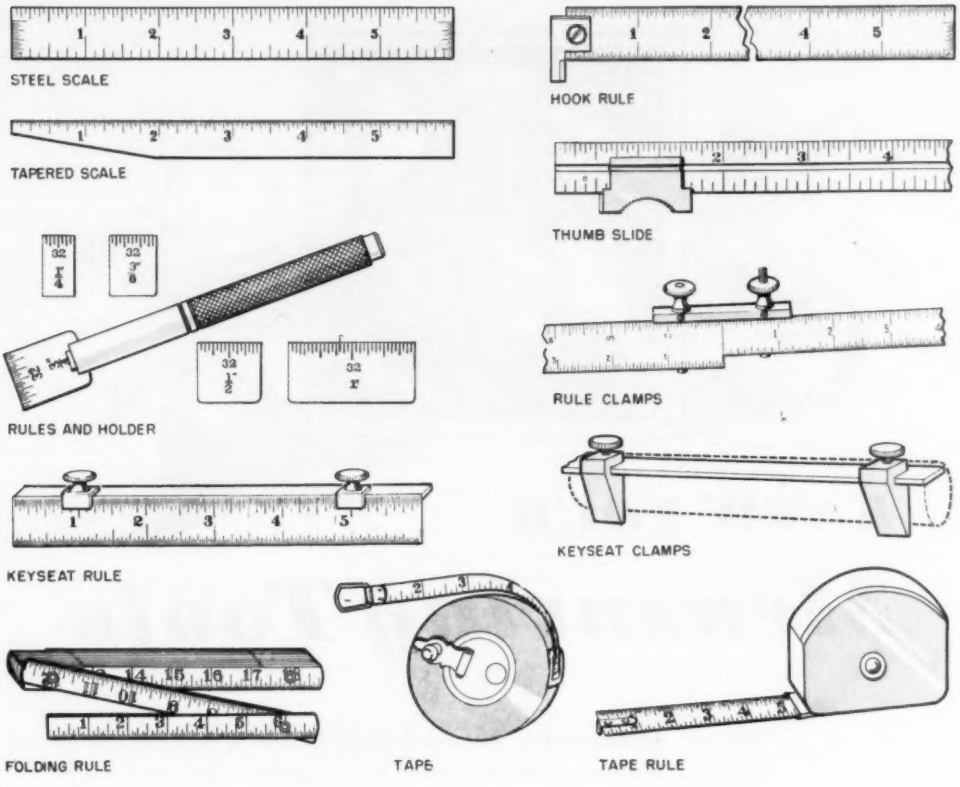
This Special Report deals with the common measuring tools used at the bench, the layout table and the machine. With few exceptions, they are the property of the worker and are kept in his toolbox. They are, in a very real sense, the tools of his trade. The more costly measuring instruments used for inspection: air and electronic gages, super micrometers, and special fixed gages made for a particular job are not considered here.

What tools are used for measuring? What are their names? What do they look like? How do you use them and take care of them? The answers to these and other questions are here.

It is to be emphasized, however, that the information given here is not directed to the skilled operator who uses these tools every day, but rather it is intended for those who are but lately come into the metalworking industry. These men experience a definite need for clear, accurate, but simple instruction to permit them to perform their work to acceptable standards.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

Copyright 1951 by McGraw-Hill Publishing Co., 330 W. 42nd St., New York 18, N. Y.



SCALES AND TAPES

OF ALL measuring tools, the simplest and commonest is the steel scale. This is usually 6 or 12 in. long, although other lengths, as 4 in., 18 in. and longer are available. Scales may be flexible or nonflexible, but the thinner the scale, the easier it is to measure accurately because the division marks are closer to the work.

As a rule, there are four sets of graduations, one on each edge of each side. The longest lines represent the inch marks. On one edge, each inch is divided into eight equal spaces, so each space represents ⅛ in. The other edge of this side is divided into sixteenths. The ¼-in. and ½-in. marks are commonly made longer than the smaller division marks to facilitate counting, but the graduations are not, as a rule, numbered individually, as they are sufficiently far apart to be counted without difficulty. The opposite side is similarly divided into 32 and 64 spaces per inch, and it is common practice to number every fourth division for easier reading.

There are innumerable variations. Sometimes the graduations are on one edge only, sometimes a set of graduations is added across one end for measuring in narrow spaces, and sometimes only the first inch is divided into 64ths, the remainder being 32nds and 16ths. Again the inch may be divided into tenths and hundredths, or the whole scale may be graduated in centimeters and millimeters. In the latter case it is called a metric scale.

With use, the ends of a scale tend to become worn, and the first and last inch will be no longer accurate. It is better, therefore, to start a measurement at some unit within the scale, at the one inch mark, for example, but care must be taken to deduct this amount from the total reading.

Special Types

Special graduations are available for pattern makers to take into account the shrinkage of the metal when cast. If a part is to be made of cast iron, for example, which has a known shrinkage of ⅛ in. per ft, a 12-in. scale will be actually 12⅛ in. long, but will be graduated into 12 parts, each rep-

resenting one inch. This saves the patternmaker the trouble of calculating each dimension. Different scales are made for each different material, although there can be no accurate rule because shrinkage varies with the same material, depending upon the shape of the part and local conditions.

Variations in scales include those with one end tapered for about 2 in. This makes it easier to measure in holes, slots, or from shoulders. Some types are equipped with a removable hook at one end to form a fixed end support when setting dividers, or to assist in taking measurements when one cannot see whether the end is flush with the end of the work. This type is particularly useful for measuring from rounded corners or through the hubs of pulleys. Another type has a steel slider which may be pushed back and forth with the thumb, and is useful for measuring against a shoulder. Never use a scale as a screwdriver or prybar, or for any purpose other than measuring.

For places where it is difficult to use an ordinary scale, a set of small sections of scale, from ¼ to 1 in. long, will be found convenient. The sections are designed to be held in a handle, and may be adjusted to any desired position to bring the graduated edge against the surface to be measured.

Numerous gadgets have been devised from time to time to increase the usefulness of an ordinary scale. Among these is a clamp for attaching two scales end to end for long measurements. The scales may be of the same or different widths. Clamps can also be had to connect two scales edge to edge to form a box square for laying out lines parallel to the axis of cylindrical work, as in scribing a keyway. Or a pair of small clamps can be attached to a single scale for the same purpose.

The edges of regular scales are made straight and true within reasonable limits of accuracy, but if an absolutely straight edge is required, a steel straightedge should be used. These are extremely accurate, and usually have one edge beveled. They may or may not be graduated, and may be up to 6 ft long. Apart from laying out straight lines, their most common use is for checking the straightness of a surface by placing the beveled edge on the surface and seeing if any light is visible between the two.

In addition to keeping them clean and oiled, particular care must be taken that the edges of a straightedge do not become nicked by being struck with a hard object. They should preferably be kept in a wooden box when not in use.

Measuring Long Lengths

For lengths greater than about 18 in., folding steel, wood, and aluminum scales, sometimes called folding rules, are usually 2 to 6 ft long. However, they cannot be relied on for extremely accurate measurements because a certain amount of play develops at the joints after they have been used for a time. Steel tapes run from 6 to about 100 ft. In the shorter lengths, these are frequently made with a curved cross-section so they are flexible enough to roll up, but remain rigid when extended. Long, flat tapes require support over their full length when measuring, or the natural sag will cause an error in reading.

Some tapes are designed to measure from the end of a ring attached to the start of the tape, while others have a blank space at the end, and readings are taken from a marked starting point.

The flexible-rigid tapes are usually contained in metal cases into which they wind themselves when a button is pressed, or into which they are easily pushed. A hook is provided at one end to hook over the object being measured so one man can handle it without assistance. On some models, the outside of the case can be used as one end of the tape when measuring inside dimensions.

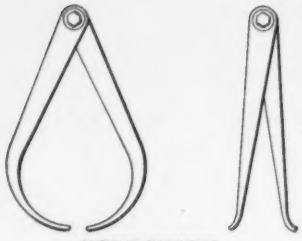
Tapes should be handled carefully and kept lightly oiled to prevent rust. Avoid kinking tapes, and pull them straight out from their cases—don't bend them backward. With the wind-up type, always turn the crank clockwise—turning it backward will kink or break the tape. With the spring-wind type, guide the tape by hand. If it is allowed to snap back it may be kinked or twisted, the end ring torn off, or otherwise damaged.

SIMPLE AND VERNIER CALIPERS

TO MEASURE diameters, calipers are used in conjunction with a steel scale. Outside calipers for measuring outside diameters are bow legged; those used for inside diameters have straight legs with the feet turned out. If the legs are joined at the top by a nut, they are called firm-joint calipers. Such types are adjusted by pulling or pushing the legs to open or close them. Fine adjustment is made by tapping one leg lightly on a hard surface to close them, or by turning them upside down and tapping on the joint end to open them. Old hands usually prefer the firm-joint and claim them to be more sensitive than other types. A variant of the firm-joint has a small screw for making fine adjustments.

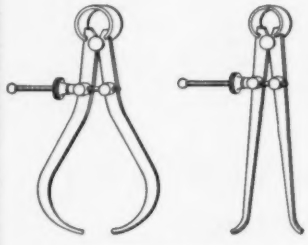
Spring-joint calipers have the legs joined by a strong spring hinge and linked together by a screw and adjusting nut. Early types were sometimes disliked because of the time required to open and close them with the nut. Newer types, however, are equipped with a special nut which grips the threads tightly when under pressure, but slides freely over them when spring pressure is relieved. This makes them as easy to open and close as the firm-joints. Their particular advantage is that, once set, they will retain their setting, and are not changed by accidental knocks or by being pushed over the work.

For measuring chambered cavities, or over flanges, transfer calipers are available. These are equipped with a small auxiliary leaf attached to one of the legs by a screw. The calipers are adjusted

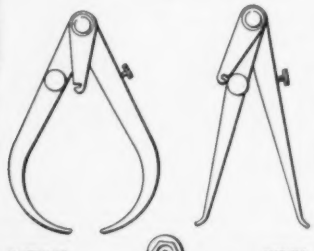


OUTSIDE AND INSIDE
FIRM-JOINT CALIPERS

OUTSIDE AND INSIDE
SCREW-ADJUSTING CALIPERS

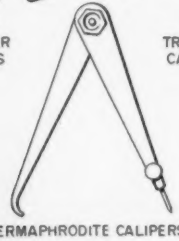


OUTSIDE AND INSIDE
SPRING-JOINT CALIPERS



OUTSIDE
TRANSFER
CALIPERS

INSIDE
TRANSFER
CALIPERS



HERMAPHRODITE CALIPERS

in the ordinary way with the leaf locked to the leg. To remove them, the screw is released, the leg opened or closed, as needed, to clear the obstruction, and then brought back and locked to the leaf again, thus restoring them to the original setting.

How to Use Calipers

Accurate use of calipers requires considerable practice and the development of a sense of touch. In measuring a piece of work, the legs should pass over it with just a slight drag. If the caliper will just barely hang from the work without falling off, the pressure is about right. It is possible to force calipers over or into work by using too much pressure, and thus to introduce an error in the reading.

When measuring with outside calipers, the axis of the calipers should be held perpendicular to the axis of the work. With inside calipers, the axes of work and caliper should coincide. It is particularly important with inside calipers that the tips of both feet bear on the work—not one foot and the side of the opposite leg. Calipers are set or read by holding one tip against the end of a scale and noting the position of the other leg.

To transfer dimensions as, for example, when it is desired to turn a shaft to fit a given hole, inside calipers may be set to fit the hole, and then outside calipers adjusted to fit the insides. This must be done carefully, and requires a steady hand and considerable skill.

If calipers are made from flat stock, the tips are thinned down and dressed to a radius. If made from round stock, the tips are rounded. Both types are thus designed to give only a point bearing on the work and permit accurate reading between the high points. Special points can also be had to fit into the bottoms of threads.

A different type of caliper is the hermaphrodite, sometimes called odd-leg or, incorrectly, "morphodite." This has one straight leg ending in a sharp point, sometimes removable, and one bow leg. It thus combines the function of divider and outside caliper, and is used chiefly for locating the center of a shaft, or for locating a shoulder. To find the center of a shaft, the bow leg is held against the OD, and the legs opened to approximately half the diameter of the work. An arc is then scribed with the sharp point. This is repeated at two other positions, approximately 120° apart, so a small triangle is formed at the center. The exact center can be located by eye at the center of this triangle. If the legs have been opened too far, the triangle will be too large, and it will be necessary to repeat the operation so a smaller triangle is formed.

Dividers are somewhat similar to calipers, but have both legs straight and terminating in sharp points. They are made in spring-joint and firm-joint types and may be used for measuring distances between two lines or points. Their principal use, however, is for scribing circles in layout work. Keep the points sharp, and of exactly the same length on both legs. Don't punch holes or cut thin metal with dividers. Lay out the circle, and then cut with tinsnips or other tools. Some mechanics cut holes in fiber gaskets with dividers, but it is poor practice and may bend the legs. If possible, make a center-punch mark to hold one point when scribing a circle to prevent it from moving.

Keep dividers and calipers clean and lightly oiled, but don't over-oil the joint of firm-joints or you may have difficulty in keeping them tight. Don't throw them around or use them for any other purpose than that for which they were designed. Remember they are measuring instruments.

Caliper Squares

The chief drawback to ordinary calipers is that they do not give a direct reading; it is necessary to compare them with a standard scale. To overcome this, the caliper square, sometimes called slide caliper, is available. It consists essentially of an L-shaped member with a scale engraved on the long shank. The toe of the L is flat on its top side and forms one of the measuring surfaces for outside measurements. The lower side is rounded to form a measuring surface for inside diameters. The

shank of the L slides in a stock which carries a mating jaw for inside and outside measurements. Two witness lines are scribed on the face of the stock for reading the scale on the shank; one for inside and the other for outside dimensions.

These tools are commonly made in 3-in. and 5-in. sizes and are graduated to read in 32nds and 64ths. A lock is provided to hold the slide at any desired position. A different style closely resembles the vernier caliper, described below, but has no vernier. Such tools are valuable when extreme accuracy is not required, and are frequently used for duplicating work when the expense of fixed gages is not warranted.

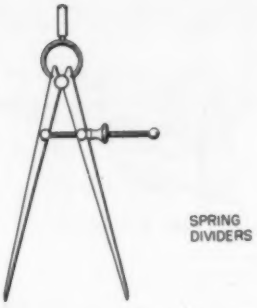
Vernier Calipers

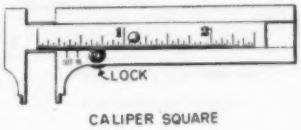
The vernier caliper permits direct reading of the distance between two surfaces to within 0.001 in. It can be used for both internal and external surfaces and has a wide measuring range. Pocket models usually measure from zero to 3 in., but sizes are available all the way to 4 ft. It consists of an L-shaped member with a scale engraved on the long shank. A sliding member is free to move on the bar and carries a jaw which matches the arm of the L. A second, or vernier, scale is engraved on a small plate attached to the slider. External measurements are taken between the inner faces of the two jaws; internal measurements between the nibs at their outer ends. On some types it is necessary to know the width over the nibs, and add this to the reading obtained. On others, two separate scales are provided.

Standard models are also made for measuring gear teeth. On these a set of jaws measures the tooth thickness at the pitch line, while a vernier-adjusted blade positioned at right angles between the jaws checks the addendum, or distance from the pitch line to the top of the tooth.

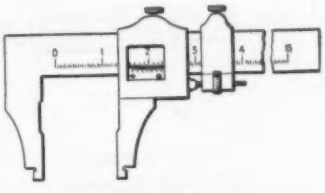
On the lower-priced models, the slider is merely pushed to the desired reading and locked by a small cam. In the more costly types, the main slide carries an auxiliary slide attached to it by a fine-pitch screw and nut. The main slide is pushed to the approximate reading, and then the auxiliary slide locked to the bar by a pressure screw. Final adjustment is made by turning the nut on the auxiliary slide to advance the main slide to exact position. When this is reached, the main slide is also locked.

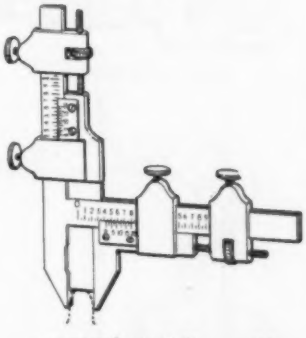
The inside faces of the jaws and the outside of the tips must be treated with great care. If they become worn, or the jaws are bent, the tool will no longer give accurate readings. If they do become worn, or if they rust and must be cleaned off, they can be adjusted by setting them to a standard and moving the vernier scale, as needed. This is a delicate job and must be performed with great care. A vernier caliper looks something like a monkey wrench, but don't ever, ever use it as such. That may sound foolish—but it has been done!


SPRING DIVIDERS



CALIPER SQUARE


VERNIER CALIPER

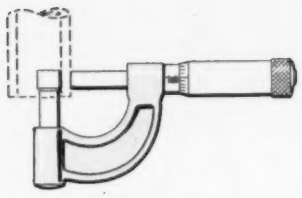

GEARTOOTH CALIPER

MICROMETER CALIPERS

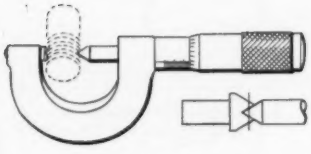
In much wider use than the vernier caliper is the micrometer caliper, commonly called micrometer or "mike." It consists of a C-frame with two gaging points. One of these, the anvil, is fixed in the frame, while the other is on the end of a threaded spindle. Attached to the frame is a barrel which houses the threaded spindle and contains a nut in which it operates. Attached to one end of the spindle is a thimble which can pass freely over the barrel. The lower lip of the thimble is graduated into 25 divisions, and as the spindle thread is 40 tpi, each graduation on the thimble corresponds to 0.001 in. The barrel is also graduated to show the number of complete revolutions of the thimble, so each graduation represents 0.025 in. On some models, a vernier scale is also provided to permit readings to 0.0001 in.

In regular models, the anvil and

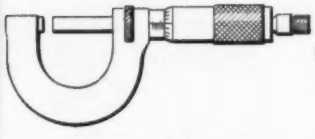
MICROMETER



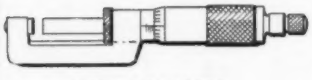
TUBE MICROMETER



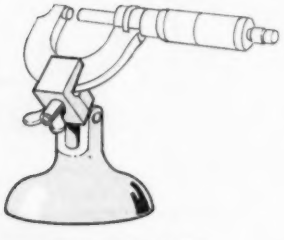
THREAD MICROMETER



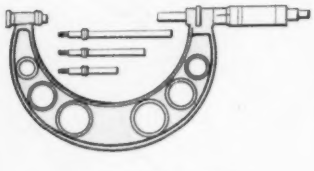
RATCHET MICROMETER



HUB MICROMETER



MICROMETER STAND



MICROMETER SET

spindle end are flat, but various special forms are available. Ball-end types are used for measuring the thickness of curved surfaces, right-angle types, having one cylindrical and one flat face, for the wall thickness of tubing, and conical-pointed types for comparing thread diameters. It is to be noted that this type will not measure the actual root diameter of a V thread, but is useful for comparison against a standard when cutting threads, and for measuring in small grooves where a standard micrometer could not be used. For actual measurement of threads, the spindle end is pointed, and the face of the anvil has the same form as the threads to be measured. Readings taken with this tool give the pitch diameter of the thread. Large-diameter anvils are used for measuring paper, sheet rubber, cardboard and similar materials.

Sensitive Touch Needed

To achieve accurate measurements requires a definite sense of touch, as with ordinary calipers, and it is quite possible for several inexperienced persons to measure the same workpiece with the same tool, and obtain slightly different readings. To overcome this, many models are equipped with a ratchet on the end of the thimble. This is so adjusted that it will slip when a predetermined pressure is reached on the anvils. When there is no ratchet, the pressure applied to the work should be such that the work will just drag slightly when passed between the anvils. Most models also incorporate a clamp nut to prevent movement of the spindle after it has been set to a definite dimension.

Standard sizes are made to read from 0 to ½ in., 0 to 1 in., 1 to 2 in., and by 1-in. steps to 60 in. Metric sizes read in steps of 25 mm and are graduated to 100ths of a millimeter. Specially shaped frames can be obtained when required. Also available are quick-adjusting models in which the nut can be disengaged from the screw for rapid, rough adjustment, the fine adjustment being made in the usual way.

Variations also exist in the shape of the frame to suit special purposes. Specially deep throats are made for measuring sheet metal well away from the edges, and extremely shallow frames which will pass through a ¾-in. hole for measuring the thickness of hubs on cutters and similar articles. There are also "mikes" with tungsten-carbide or synthetic-sapphire anvils to increase wear resistance.

How to Use

To use a micrometer, hold the frame in the palm of the hand with the third or fourth finger passed through the opening, and rotate the thimble with the thumb and first finger. With large sizes, over about 3 in., it will be necessary to use both hands, one to hold the frame, and the other to turn the thimble. Hold the tool lightly and for only as long as is necessary to make the measurement. Wrapping the hand around it, or holding it for too long a time will cause expansion of the metal and will introduce errors in measurement.

To move the spindle a considerable distance, hold the frame in one hand and roll the thimble against the palm of the other hand. Don't hold the thimble and twirl the frame around, as this will cause rapid wear on the threads and spoil the tool.

Accessories

If a micrometer is to be used as a gage for checking a number of pieces, the spindle is adjusted to the desired size and locked with the locknut. To simplify inspection, special stands can be obtained to hold the frame at any desired angle, leaving both hands free for bringing the work to the gage. Another useful accessory is a set of interchangeable anvils in accurate 1-in. steps to permit a large micrometer to be used for small measurements. Thus, a 4-in. micrometer with a 3-in. anvil can be used for measuring 0 to 1 in. Master test gages are sometimes supplied for checking the accuracy of the tool.

Keep the tool clean and lightly oiled, and preferably in its case or box when not in use. Anvil faces must be protected from damage, and must never be "touched-up" with emery cloth or other abrasive. If they become worn, they must be accurately lapped true and

flat, and the spindle adjusted to suit. A micrometer looks something like a small C-clamp, but the man who uses it for such a purpose deserves to be driven from the shop.

Inside Micrometers

Companion tool to the ordinary micrometer is the inside micrometer. This consists of a thimble and barrel similar to an outside micrometer, but a hardened anvil is provided on top of the thimble. Extension rods with hardened ends are attached to the end of the barrel. Rods are furnished in sets to cover a wide range of sizes, and are marked in ½-in. or 1-in. divisions, depending upon whether the screw adjustment is ½ in. or 1 in.

To use this tool, select a rod of suitable length, and adjust it in the barrel to the nearest inch or half-inch. Place the tool in the hole to be measured, with the rod end on one wall, and turn the thimble until its anvil contacts the opposite wall. Make sure the maximum dia is being measured, and that the tool is at right angles to the axis of the hole. To do this, oscillate the tool through two planes to be certain of proper contact. Read the even inches from the rod, and the thousandths from the barrel and thimble. As with an outside micrometer, a sense of feel must be developed. For use in deep holes, an auxiliary handle may be attached to the side of the barrel.

The smallest diameter that can be measured with regular inside micrometers is about 1 in. For sizes below that, there is a special type equipped with jaws similar to those of a vernier caliper. These may be used for holes as small as 0.2 in.

Other Inside Tools

When less expensive tools are required, the telescoping gage can be used to advantage. This is a T-shaped tool in which the shaft of the T acts as a handle, and the cross-arm is used for measuring. The cross-arms telescope into each other, and are held out by a light spring. To use it, the arms are compressed, placed in the hole, and allowed to expand. A twist of the locknut on top of the handle locks the arms, and the tool may then be withdrawn and the distance across the arms measured with an outside micrometer.

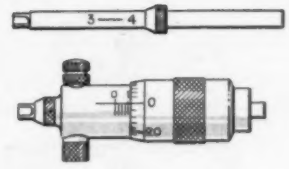
These tools are commonly furnished in sets, the smallest for 5/16 to ½ in., and the largest for 3½ to 6 in.

For still smaller sizes, a small hole gage may be employed. This consists of a small, split, ball-shaped member mounted on the end of a suitable handle. The ball is expanded by turning a knurled knob on the handle until the proper feel is obtained, and then the size measured with a micrometer. The smallest unit will measure from about ⅛ to 3/16 in., and the largest from ⅜ to ½ in. On some types the ball is flattened off at the bottom close to the center line to permit its use in shallow holes and recesses.

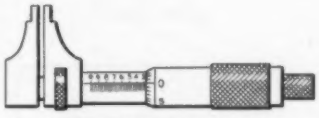
Depth Gages

The depth of holes or slots is usually measured with a depth gage. This consists of a small, flat or round scale attached to a flat head by a slotted screw. When the screw is loosened, the scale can slide up or down, as required. On some types the head has radial markings to permit the scale to be set at an angle. This is not intended for accurate angular measuring, but is convenient for duplicating an angle.

To use this tool, the binding screw is loosened, the head placed on a flat surface, and the scale raised or lowered as needed. The screw is then tightened, the tool removed from the hole, and the depth read directly from the scale. If more exact measurements are required, a depth micrometer may be employed. This is similar to the simple tool, but is equipped with a micrometer thread and spindle in place of the scale. Other models may be obtained with a vernier, or with a direct-reading dial. When these tools are used, the base should be held down firmly, and the measuring scale or rod lowered carefully until it just touches the bottom of the hole. Only very light pressure should be used, or the base may be raised off the surface on which it rests, and a faulty reading will be obtained.

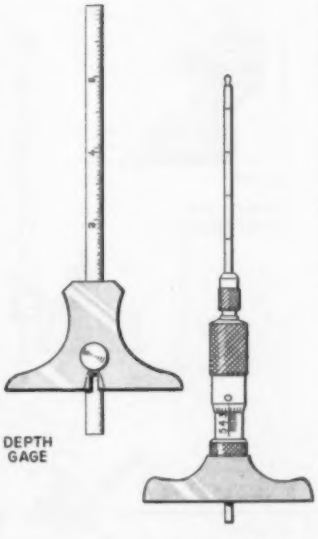


INSIDE MICROMETER

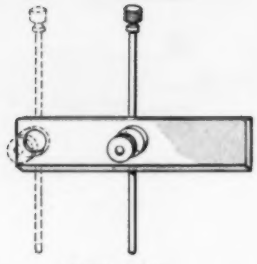

INSIDE MICROMETER CALIPER

TELESCOPE GAGE

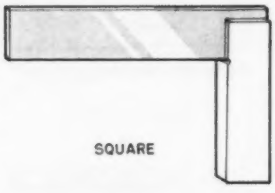
SMALL HOLE GAGE



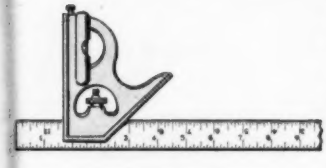
DEPTH MICROMETER



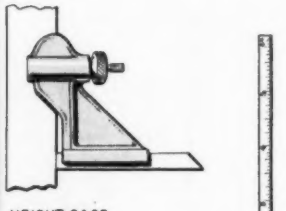
DEPTH GAGE



SQUARE



COMBINATION SQUARE



HEIGHT GAGE ATTACHMENT

DEPTH GAGE ATTACHMENT

CENTER HEAD

If the opening to be measured is wider than the base of the gage, extension pieces may be placed under the base, or a straightedge type of gage used. This is a steel straightedge with the lower edge beveled, and is equipped with a binding screw for a flat or round scale. The scale may be positioned at the center or near one end.

SQUARES & PROTRACTORS

TO CHECK whether one surface is exactly at right angles to another, a steel square is required. This consists of a rectangular bar, the stock, with a thinner blade permanently attached to it and accurately ground so the angle between blade and stock is exactly 90°. Sometimes the blade is made removable or adjustable so it projects a greater or less distance from the stock. Extra blades are often supplied with this type, with the ends ground to commonly used angles such as 45 and 60°, for octagons and hexagons; or at 59°, the cutting angle of a drill, and 41°, the angle of countersunk screw heads. Special diemaker's squares have the blade adjustable at an angle to the stock to serve as a gage for filing clearance in dies.

More commonly used than a simple square is the combination square. As its name implies, it combines the functions of several tools, and serves a wide variety of purposes. It consists of a hardened steel scale and a movable head. The head may be adjusted to any position along the scale and clamped securely, or may be removed entirely. It can thus serve as a depth gage, height gage, or scribing gage. Two of the faces of the head are ground at right angles to each other, and a third face at 45°. A small spirit level is built into the head for checking whether surfaces are plumb, and a small scriber is housed in a hole in the end of the head.

The utility of this tool may be further increased by various attachments. Among these is a sliding clamp and scriber to be used on the scale to convert it into a height gage. While lacking the precision of the vernier height gage, it is still adequate when measurements are in fractional inches and may be read from the scale. Another attachment will convert the square into a depth gage by means of a slider holding an auxiliary scale at right angles to the main scale.

A popular accessory is the center head which can be slid on to the blade in place of the regular head. This is a V-shaped member so designed that the center of the 90° V will lie exactly along one edge of the blade. If the end of a piece of round stock is placed in the V, a line scribed along the edge of the blade will pass through the center of the stock. If this operation is repeated after rotating the stock approximately 90°, the intersection of the two lines will mark the exact center.

Protractors

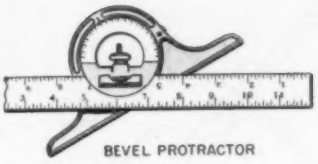
Even more valuable is the protractor head, commonly called a bevel protractor, which can also be attached to the scale, adjusted to any position on it, and turned and locked at any desired angle. Some types have the head on only one side of the blade, others have it extending on both sides. Angular graduations usually read from 0 to 180° both ways, permitting the supplement of the angle to be read. A spirit level may be included on some models forming, in effect, an adjustable level to show any required degree.

Simple protractors consist of a semi-circular steel plate, graduated in degrees, and having a straightedge pivoted at the center point. This arm may be swung to any desired angle and locked in place. For more accurate work, the universal bevel protractor is used. This has the stock slotted to permit the blade to pass through, and the blade can be adjusted in or out, as desired. On some models the dial is graduated 0 to 90° each way; on others the graduations extend right around. The better grades are equipped with a vernier to permit readings to 5 min. For small acute angles a small additional

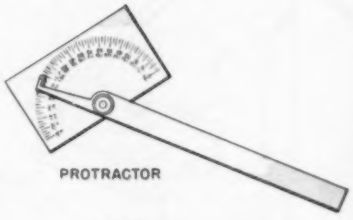
blade may be attached to the stock by a clamp screw.

By turning the blade around and moving it in or out it is possible to measure angles from either a horizontal or vertical surface, and even undercut angles, as on dovetails. However, considerable care must be exercised in reading the dial to make sure that one is reading the true angle, not its supplement.

There are occasions when it is not convenient to use a bevel protractor, or when it is not necessary to measure an angle—but merely to reproduce it. In such cases a bevel may be used. This consists of two slotted bars linked together by a clamp screw; or in the case of a combination bevel, three bars, one of which is not slotted but has a clamp screw on which the second bar can pivot. The bars can be adjusted into an endless variety of positions to check one or more angles, and their relationship checked with a protractor or used merely as a gage.



BEVEL PROTRACTOR



PROTRACTOR

HEIGHT & SURFACE GAGES

FOR MEASURING and marking off vertical distances from a plane surface, the vernier height gage is indispensable. It consists of a vertical scale attached to a foot which is ground flat and true. The member which slides on the scale carries a jaw to which a hardened steel scriber may be clamped.

To use the tool for layout, the edge of the scriber is adjusted to the required distance above the foot by means of the vernier. The gage and the work are then placed on a surface plate, and the necessary layout lines scribed with the scriber. If the required lines are below the height of the gage foot, a special offset scriber will be required.

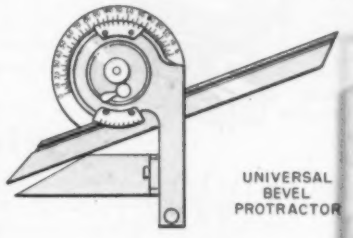
In taking a measurement, the lower face of the scriber is used, and the slider is brought down until the scriber just contacts the work surface. The foot must be held down firmly, and care used in adjusting the vernier, as it is quite easy to use too much pressure and thus lift the edge of the foot clear of the surface plate. To make sure the adjustment is correct, slide the gage clear of the work, and then slide it back again.

For measuring inside recesses, a depth-gage attachment may be obtained. This is simply a rod which is attached to the jaw by a suitable clamp. It must be understood, however, that this does not give a direct reading. The rod must first be adjusted to the upper face of the work and a reading taken on the vernier. Then, when the rod is adjusted to the bottom of the hole, the depth from the top face will be the difference between the two readings.

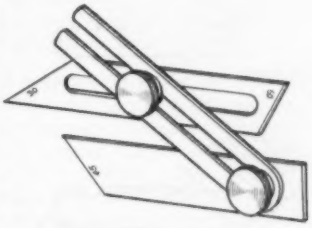
Surface Gages

If less precision is required, the conventional surface gage will be found completely satisfactory for layout work. This consists of a heavy base and a pivoted upright to which a scriber is attached by a clamp. The scriber can be clamped at any point along its own length, or along the length of the upright, and may be rotated through a full circle. One end is bent to permit scribing on horizontal surfaces. The upright may be rotated through approximately three-quarters of a circle, a cutout in the base permitting it to be turned into a downward position. It is carried on a hinged arm equipped with a screw for making fine adjustments. For work close to the base, the upright may be removed and the scriber inserted into the swivel bolt. On some models a thin hardened steel plate is attached to the lower end of the upright to act as a scriber for close-quarters work. The base may be soft or hardened and ground, and has a V formed in the base to permit its use on cylindrical work. Gage pins in the base can be pushed down and used against the edge of the surface plate or the side of a T-slot. The height of the scriber is set to a scale or other reference.

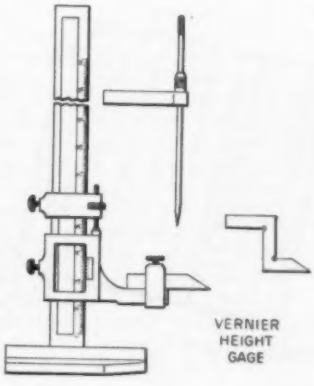
The scale must, of course, be set exactly vertical to give a correct reading, and a scale in a combination square is recommended. If this is not available, a scale holder may be obtained. This is a heavy,



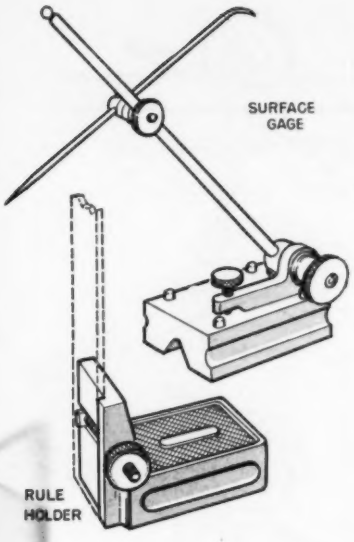
UNIVERSAL BEVEL PROTRACTOR

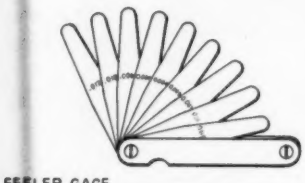


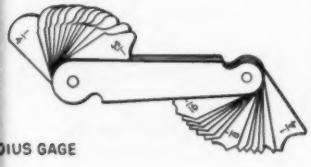
COMBINATION BEVEL

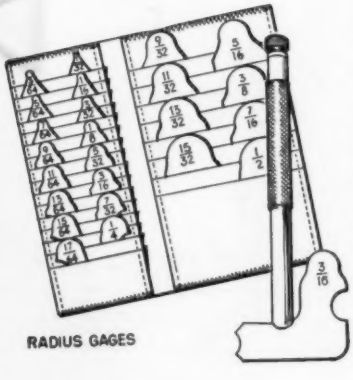


VERNIER HEIGHT GAGE




FEELER GAGE


RADIUS GAGE


RADIUS GAGES

flat-bottomed block with a clamp screw designed to grip scales of varying widths. Another common use for a surface gage is as a holder for a dial-test indicator. In this connection, it is to be noted that there is now available a model with a magnetic base which will hold the indicator firmly on iron or steel surfaces in an upright, horizontal, or even upside-down position. Permanent magnets are housed in the base and can be made to hold or release by turning a small lever at the rear, which has the effect of reversing the polarity.

MISCELLANEOUS GAGES

THICKNESS gages, commonly called feeler gages, are thin strips of flexible steel of known thickness, usually made up in groups of from 10 to 25 different pieces, and hinged to fold into a handle like a pocket knife. Each leaf may be used separately or in combination with others. They are used for checking clearances between surfaces, and for similar work where no other tool is practicable. They must be handled carefully to avoid kinking or nicking the edges.

Radius gages consist of groups of steel blades, made up in pocket-knife style, with accurately formed radii on their ends. Usually, the blades at one end of the holder are for convex radii, and those at the other end for concave radii. On some types, the radii are formed tangent to one edge of the blade for greater convenience in checking corner radii and fillets. Individual blades are also available in sets with a detachable handle, each blade being a separate unit and having both internal and external radii of the same size.

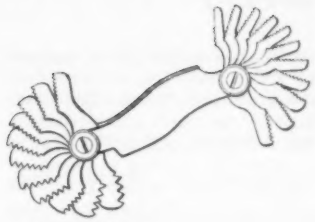
Angle gages are similar, but have the ends of the blades ground to the more commonly used angles. They are particularly useful for checking angles on tools and dies, and in locations where a protractor cannot be applied conveniently.

Screw-pitch gages are used to determine the pitch of threads. They consist of thin leaves whose edges are toothed to correspond to standard thread sections. Successive leaves may be placed on a thread of unknown pitch until some one leaf is found to coincide exactly, and the pitch can be read from the number stamped on it. These gages are available in all standard and metric thread forms, and in many cases have a second number stamped on the leaves to show the double depth of the thread.

For rapid checking of wire and sheet stock, a wire gage will be found convenient. This is a circular metal plate, having radial, keyhole notches cut into its edge. Each notch is numbered with its corresponding wire size, and the readings are taken between the flat sides of the notch. Models are available for each of the different gage systems for wire and sheet and for different materials. Similar gages are also made for checking the form of thread-cutting tools.

Tap and drill gages are hardened steel plates, having a number of holes corresponding to the standard drill diameters. They furnish an easy means of checking drill sizes, and usually have marked on them the correct size of drill for tapping and for clearance holes for standard machine screws.

When threads are cut with a single-point tool, it is imperative that the tool be exactly at right angles to the axis of the work. This can be checked with a center gage, a small steel blade ground at one end to a sharp 60° point, and having a deep 60° notch in the other end. Smaller 60° notches are formed in one or both edges. In use, the gage is held against the work, and the tool adjusted until it fits exactly into one of the notches in the edge. Care must be taken to hold the gage level, and this can be simplified by using an attachment in the form of a small V-block, having a slot to hold the center gage. The notches can also be used for checking the angle of the tool during grinding. The blade is usually marked with graduations corresponding to common threads per



THREAD GAGE

DRILL GAGE

WIRE GAGE

inch, and with a table showing double depth of thread of commonly used sizes.

For satisfactory results when sharpening drills, both lips must have the same angle and be of the same length. A drill-point gage for checking this consists of a small triangular blade attached to a slider on a steel scale. The drill is held against the edge of the scale, and its point angle checked against the blade. The edge of the blade is graduated in inches for measuring the length of the lips. The blades can also be obtained as separate accessories to be used on an ordinary steel scale.

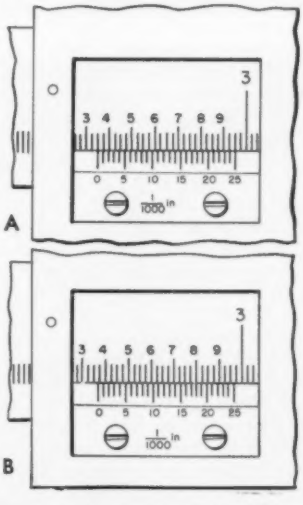
How to Read a Vernier

THE VERNIER consists of a small scale having a certain number of graduations which equal, in combined length, a different number of graduations, usually one or more less, on the long scale of the tool. Thus if, in the same extreme length, the vernier has divisions greater or less in number by one than the scale, there must be a small difference between a division on the vernier and a division on the scale. The readings depend upon the difference between the vernier and the scale divisions.

The accompanying illustrations show a vernier used with a scale which is graduated into 40ths or 0.025ths of an inch. The vernier has 25 divisions, numbered every 5th division, which equal, in extreme length, 24 divisions on the scale, or 24 × 1/40 = 0.600 in. Thus, one division on the vernier equals 1/25 of 0.600 in. = 0.024 in. Therefore the difference between a division on the vernier and a division on the scale is 0.025 — 0.024 = 0.001 in.

When the reading is exact, with respect to the number of fortieths of an inch, the zero on the vernier coincides with a graduation on the scale—either inch, tenth or fortieth, as the case may be. This leaves a space between lines on the scale and the 1, 2, 3, 4, 5, etc. lines on the vernier of 0.001, 0.002, 0.003, etc., respectively, the difference increasing 0.001 at each vernier division in numerical order until, at the 25th division, the lines again coincide. This is shown in illustration A.

Thus when the 1st, 2nd, 3rd, etc. line on the vernier coincides with a line on the scale, the zero of the vernier has moved 1, 2, or 3, etc., thousandths of an inch past the previous fortieth graduation to bring these lines together.



Vernier scale, showing at A a reading in even hundredths of an inch, and at B a reading in thousandths

To Read the Vernier

Note the inches, tenths and fortieths of an inch that the zero on the vernier has moved from the zero on the scale, and to this reading add the number of thousandths indicated by the line on the vernier that coincides with a line on the scale.

For example, illustration A shows the zero graduation on the vernier coinciding with a fortieth graduation on the scale (the second fortieth beyond an even tenth graduation). This indicates that the reading is exact with respect to fortieths of an inch. The reading therefore equals 2.000 + 0.300 + 0.050 in. = 2.350 in. In illustration B, however, it will be noticed that the zero on the vernier scale lies between the second and third fortieths, and that the 18th vernier graduation is the one which coincides with a line on the scale. This indicates that 0.018 in. should be added to the scale reading. The reading then equals 2.000 + 0.300 + 0.050 + 0.018 in., or 2.368 in.

How to Read a Micrometer

THE customary pitch of the screw in English measure micrometers which measure in inches is 1/40 in. or 0.025 in. This is equivalent to 40 threads per inch and means that, with one complete and exact revolution of the micrometer screw, the contact face at the end of the spindle has moved away from or toward the face of the anvil exactly 0.025 in.

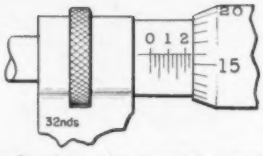
The lines on the barrel conform to the pitch of the micrometer screw, each line indicating 0.025 in., and each fourth line is numbered 1, 2, 3, etc. to indicate hundreds of thousandths—0.001, 0.002, 0.003 in. etc. The beveled edge of the thimble is graduated into 25 parts, so each line indicates 0.001 in.—1/25th of the 0.025 in. covered by one complete revolution of the thimble. Every fifth line on the thimble is numbered.

To read a measurement in thousandths of an inch: To the number of hundreds of thousandths indicated by the highest figure visible on the barrel, add 0.025 for each line visible between that number and the thimble edge. And to this total add the number of the line on the thimble which coincides with or has passed the long parallel or axial line on the barrel. Thus in upper illustration:

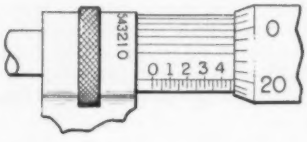
Highest figure visible on barrel	2 = 0.200 in.
Lines visible between number 2 and thimble edge	1 = 0.025 in.
Line on thimble which coincides with or has passed long line on barrel	16 = 0.016 in.
Reading of measurement	Total 0.241 in.

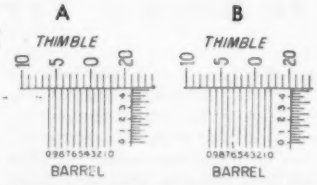
Readings to 0.0001 in. are obtained by a vernier on the barrel on some models. The vernier has 10 divisions which equal the overall space of 9 divisions on the thimble. Therefore the difference between a division on the thimble and a division on the barrel is 0.0001 in.

The zero lines of the vernier and thimble coincide when the reading is exact in thousandths, and the differences between lines on thimble and lines on vernier at 1, 2, 3, etc. = 0.0001, 0.0002, 0.0003 in. etc. Thus as the 1, 2, 3, vernier line coincides with a thimble line, the thimble has moved past the exact setting 1, 2, 3, etc., ten-thousandths of an inch.



Simple micrometer, showing a reading in even thousandths. Note how lines on thimble align with index line on barrel





Vernier micrometer with enlarged view of the vernier, showing how the vernier lines (left) fall for a reading in even thousandths, and (right) how they fall when reading is in tenths of thousandths

To read, first obtain reading in thousandths, and add to this the ten-thousandths indicated by the coinciding lines of the vernier and the thimble. In example A there are no ten-thousandths to add, as the zero lines on vernier coincide with lines on thimble, so reading is 0.4690 in. In example B, the 7th graduation on the vernier coincides with line on thimble, indicating that 7/10,000 in. should be added to the thousandths reading. So the reading in this case would be 0.4697 in.

On micrometers having an auxiliary thimble for direct readings by ten-thousandths, the procedure is somewhat different. The thousandths are read in the conventional manner, and to this reading is added the reading in ten-thousandths taken direct from the small auxiliary thimble. This reading is taken by turning the thimble until the long horizontal line on the barrel coincides with a graduation line on the bevel of the main thimble, and reading the figure on the auxiliary thimble.

The auxiliary thimble actuates the barrel through an eccentric and connecting arm, so that, as it is rotated, it rotates the barrel. The barrel is in the form of a sleeve which turns independently of the spindle without disturbing the setting. As ten graduations on the auxiliary thimble equal in movement one graduation on the main thimble, each graduation on the auxiliary thimble indicates one ten-thousandth of an inch. These graduations are widely spaced, and parts of a ten-thousandth can be estimated, if desired.

This type is less well-known than the vernier type, and is somewhat more expensive, but is considerably easier to use and there is much less chance of an error in reading. It may be furnished with or without a ratchet stop, although the use of the ratchet is recommended when working to such close dimensions as ten-thousandths.

Essentially, a micrometer or vernier is easy to read, but it is equally easy to make a mistake in reading. Considerable practice is needed, and the beginner is advised to check each step carefully. Even experienced workers often find it advisable to note down on paper the number of 25 thousandths, thousandths, and ten-thousandths, and add these up to get the full reading.

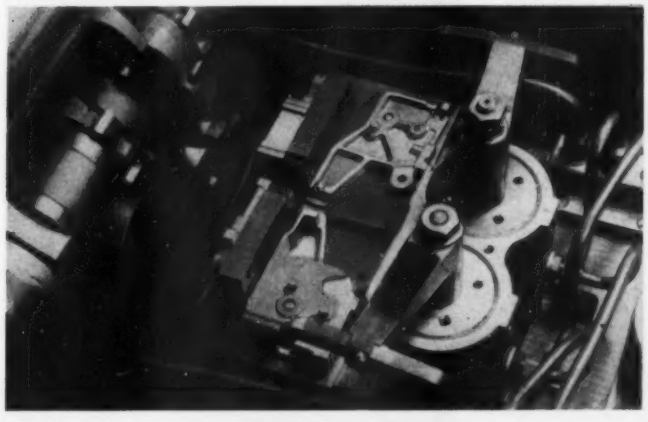
The cooperation of Brown & Sharpe Mfg. Co., Lufkin Rule Co., and L. S. Starrett Co. in the preparation of this Training Manual is gratefully acknowledged.

AIR CAN CLAMP SMALL PARTS, TOO

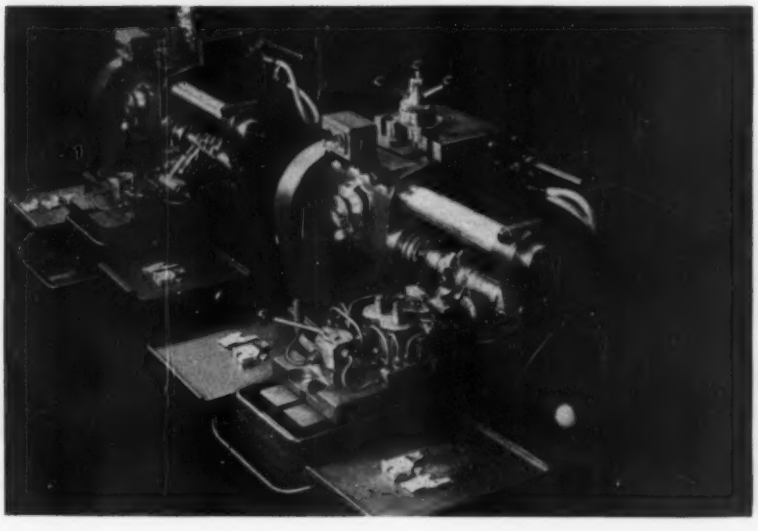
Pneumatic machining fixtures for large and medium-size parts are fairly common nowadays, but relatively few are made for small parts like components for office machines. These neatly designed fixtures, in an Italian typewriter plant, show sensible use of air cylinders for both small and normal-size machining jobs

BY DR ING C. SANVENERO, Chief Tool Engineer, C. OLIVETTI & CO., IVREA, ITALY

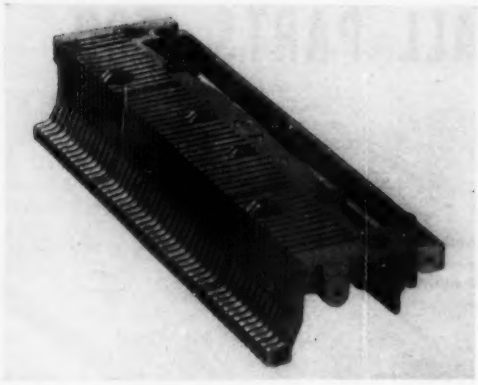
Typewriter side plates are aluminum die castings that require 12 boss areas to be machined flat to match other parts



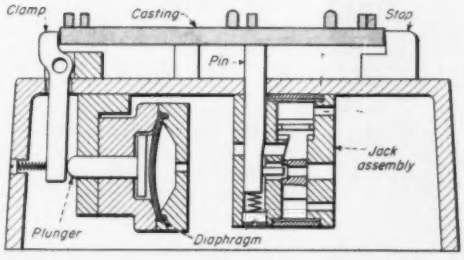
Fixture has two buried cylinders that swing and depress self-balancing (two-point) clamps to grip horizontal pair of parts. Helical grooves in spindle work on fixed pin to swivel clamps 90°, thus simplifying loading. Two cylinders under cutter move similar clamps against two parts that mount vertically



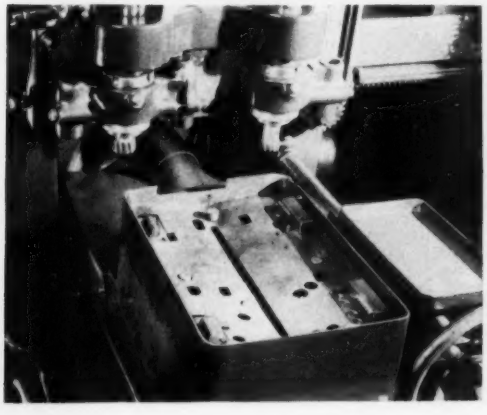
Machines are light, cam-operated automatic millers, run by one operator to produce 91 pieces per hour. Rear setup cuts remaining flats on the same parts

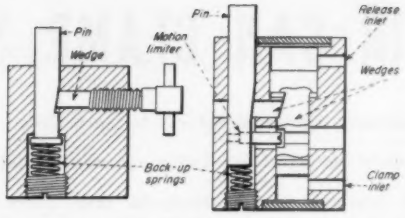


Key-lever guide for portable typewriter requires heavy load of 48 cutters that mill the slots. This would normally cause excess vibration and deflection

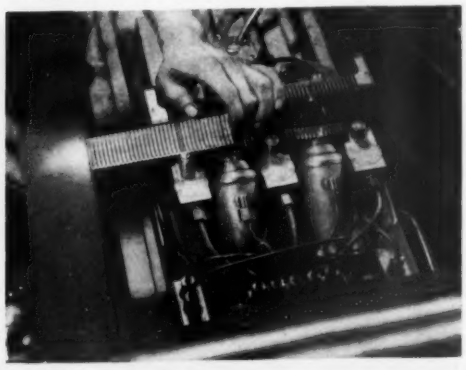


Baseplate casting for adding machine (above) is set up with support jacks and clamp arms that hold the edges of the casting. Clamp stroke must be short but powerful, so diaphragm and plunger replace regular air cylinder. **Double-spindle machine** with end-milling cutters (below) faces bosses on baseplate. Work rests on three fixed pads and two pneumatic jacks. Diaphragm under fixture operates two clamps on each side of plate

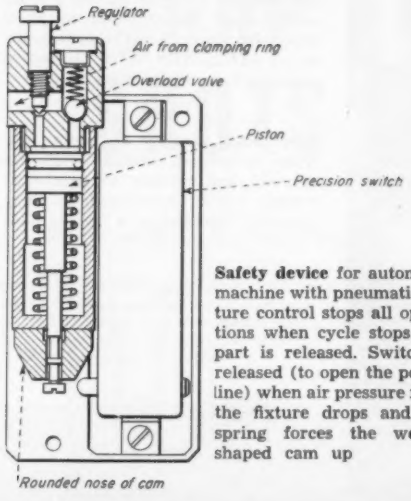




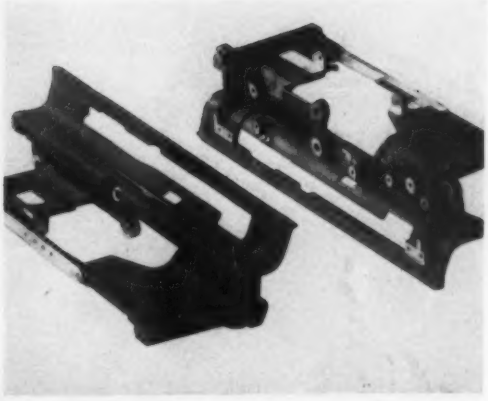
Support jack (above) kills deflection of parts under heavy cutting load. Part is positioned, forcing pin down. Then wedges are tightened to prevent deflection. Pneumatic design (right) is more accurate, more convenient, and faster than manual design (left). **Lever-guide fixture** (below) has three support jacks under the casting. Two air cylinders under the fixture clamp the work and control air to the jacks, making support automatic



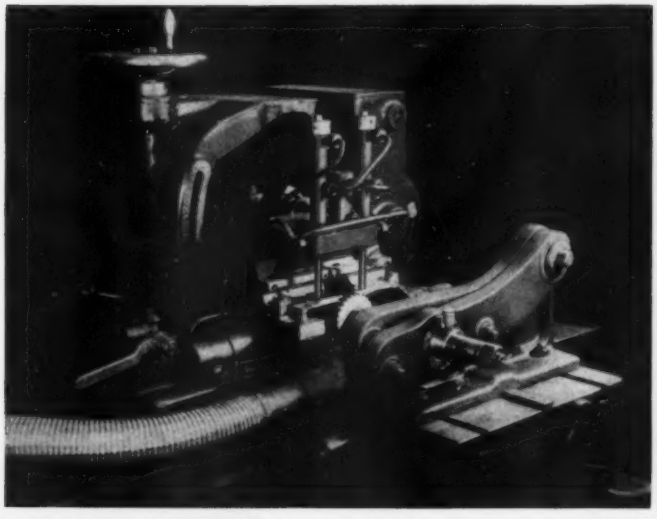
Inclined cylinders for milling job use wedging principle to clamp parts with less air pressure. Piston angle must exceed friction angle to prevent slips



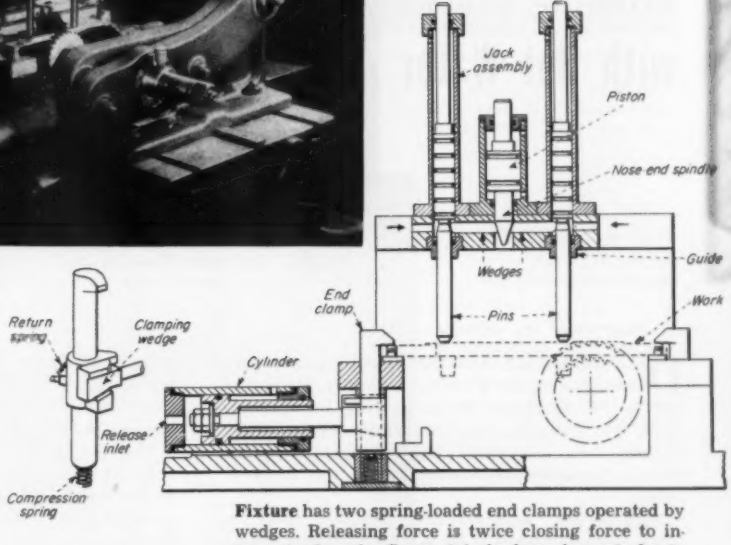
Safety device for automatic machine with pneumatic fixture control stops all operations when cycle stops and part is released. Switch is released (to open the power line) when air pressure from the fixture drops and the spring forces the wedge-shaped cam up



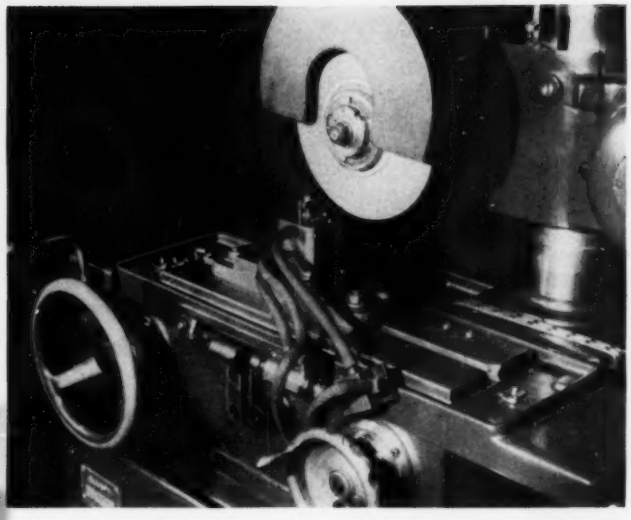
Typewriter-carriage guide requires machining from below so chips can be exhausted by suction collector. Regular clamps can operate at ends of the work only



Machine is light automatic miller with chip collecter under cutter and cutter under fixture. Special arbor support is outboard. Two spring-loaded support jacks are directly over cutter

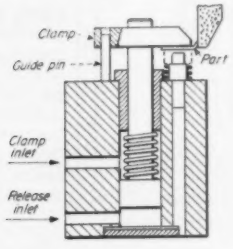


Fixture has two spring-loaded end clamps operated by wedges. Releasing force is twice closing force to insure steady grip. Support jacks have long stroke to clear for loading. Cylinder with nose-end spindle spreads wedges to lock jacks after they are in position



Machine is a sensitive surface grinder with fixture valves fitted to work from table stops. One at right is single-acting part-ejection valve; at left is double-acting clamp valve

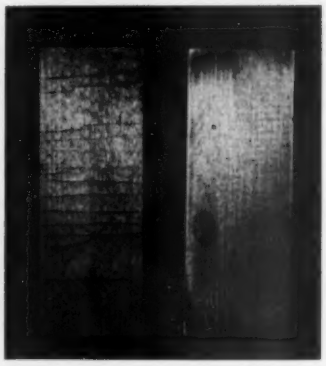
Sheet-metal part for an adding machine is located, clamped, held accurately, and released by pneumatic fixture for a few-second grinding operation. Production is 790 per hour



Prevent Grinding Cracks with Hot Water

BY J. A. OSBORNE
Hq. Mfg. Eng. Dep't,
Westinghouse Electric Corp.

Surface-grinding setup like this often produces latent cracks in work by setting up internal stresses. Test of sample part proves water-bath treatment after grinding relieves stresses, stops cracks



Etched samples show normal surface cracks with conventional handling (left) and clean surface without cracks after low-temperature stress relieving (right). Grinding of samples was identical

DELAYED SURFACE CRACKING on tools and dies as a result of grinding *can* be prevented. Results of tests at Westinghouse Manufacturing Laboratories prove that a simple, low-temperature treatment requiring little equipment but some patience can relieve stresses in high-carbon products of the toolroom.

High-carbon, high-chrome tool-steel specimen blocks were hardened to 63 R_c, then severely ground to cause residual stresses consistently in all the blocks. Half of the samples were acid-etched immediately, while the other half were held in a clean hot-water bath at 212F for 18 hr, starting right after they were ground. After this the treated batch was allowed to cool in air, then acid-etched.

The results clearly show up in the photo.

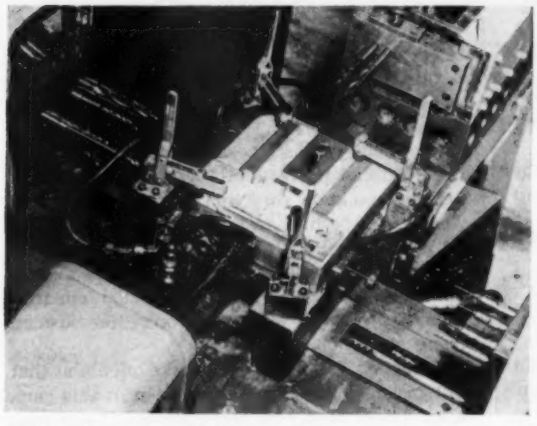
To allow no compromise of the hardened qualities of the metal, temperatures above 212F could not be used effectively. Length of treatment shorter than 18 hours was not satisfactory, either. After treatment in water—or in a heated furnace with air at the same temperature—hardness was not affected.

SHOP SHOTS

at

GRAY MFG. CO., HARTFORD

Automatic lubricator for strip used in drawing the chassis of the Gray Audograph consists of an oil well and felt roller for the lower side, and a spray nozzle for the top. Spray is provided by a hose from a can attached to the press frame



Multi-spindle way drill made by welding two old lathe beds to form a cross. Drillheads are belt driven from a single motor through shafts and a gearbox at center of machine. Labor cost is reduced 75% and tool cost 30%, as compared with single-spindle drills

Mohair strips are attached to Audograph frame with double-backed adhesive tape. Note the motorized dispenser and cutter. Production time is decreased 28% below that required for liquid adhesive. Electric hair clipper trims mohair to even height after assembly

Wooden tote boxes have removable sides made of loose boards. This makes it easier for operators to pick up and dispose of parts when working in 3-ft deep pits in which presses are set. Handling time has been cut about 40% with this arrangement

ROUND TABLE

TEA FOR TWO

"Hello, Ed, where are you going in such a hurry? And why the black looks?"

"I'm headed for the front office, Al, and I'm going to scream my head off. What do they think we're running here—a machine shop or a tea room?"

"Now just a minute, Ed, what are you talking about?"

"Why, that new order, of course; the one that says they're going to have a wagon come around at ten o'clock and sell coffee and stuff."

"Well, for Pete's sake, what's wrong with that? I think it's a fine idea."

"Fine idea, my foot! Do you realize what it's going to do to your production?"

"Sure I realize, Ed. It's going to give it a lift."

"Now, see here, Al. You've been a foreman long enough to know that if the 60 men in your department each take a quarter of an hour off to guzzle coffee, you're losing 15 manhours a day. That's the same as having two men out all day."

"You've got the wrong idea, Ed. A man begins to slow up a bit around ten, and a few minutes rest and a cup of coffee will set him going again at full speed."

"Nothing of the kind. He's just hitting full stride by that time, and if you break him off you'll lose additional production until he gets steam up again."

"That's just the trouble with you, Ed. You think men are machines. Scientific studies show that if you give a man a short rest and some quick energy food, you more than make up the few minutes lost."

"You and your science. Science is like statistics—you can prove anything you want with it. Besides, you know very well that the few minutes would soon be half an hour."

"Well, now, I don't know how it is in your department, but when I tell my boys to break it up, they break. And if you can't stop 'em from turning it into a tea party you've no business being a foreman."

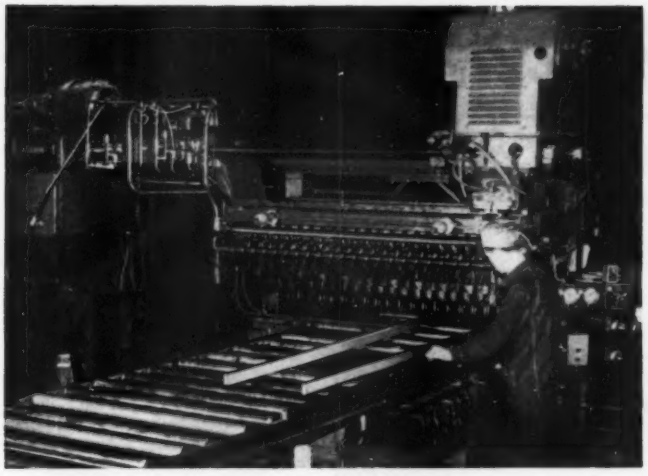
"Look, Al, I'm not going to take offense at that, but just let me tell you. I've been at this game a lot longer than you, and I know. If you want to get production you've got to drive 'em, not coddle 'em. You and your cups o'tea! It never hurt anybody yet to put in four straight hours from eight to twelve. When I was serving my time. . . ."

"Yeah, I know. When you were an apprentice, men were treated like dogs. But that's a long time ago. We're living in a different age now. It isn't just the matter of a cup of coffee, it's the spirit behind it. It's the open recognition that within the limits of ordinary discipline, men have a right to decent treatment and a reasonable amount of liberty."

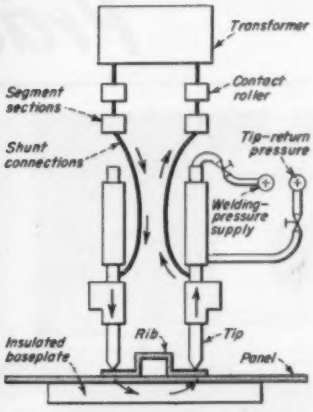
"Oh, quit talking like a reformer, Al."

"All right, go ahead and do your screaming, and see where it gets you."

***IS THERE A 'COFFEE TIME'** in your plant? Do men take advantage of it to waste time? Or do you agree with Al that it gives them a lift and pays off in increased production and better employee relations? Others will be interested in your experience. Discussion of earlier topics on later pages.*



Multi-welder spots both flanges of ribs to wall panel, one rib at a time. Wooden rib positioners slide through welder throat, between tips, to hold spacing exact until all spotwelds have been made



Welding current for one pair of tips follows path through connector, tip, stock, baseplate, opposite tip, and back to transformer. Current surge is controlled electronically

40 Spotwelds at Once, Electronically

That's the score with a welder that joins "hat"-section stiffening ribs to steel panels to make movable office walls. The unusual machine, built especially for this job, fires up to 40 welding tips in a progressive cycle; making clean, hard-to-detect joints on 3-in. centers on panels as wide as 64½ in.

BY CHARLES STUDER, Chief Industrial Engineer, E. F. HAUSERMAN CO.

ELECTRONIC control of welding current and hydraulic control of the transformer carriage, welding-tip position, and tip pressure are combined in a multi-spotwelding machine built by National Welder Co. in consultation with Hauserman engineers. Although the actual welding operation at each tip is conventional, the multiplicity of tips allows high production at a conveniently arranged machine for a job that would be tough otherwise.

The setup includes two roller tables on which large panels can be easily handled. Stock is cold-rolled steel, 20-gage for the panels, and 24-gage formed "hat"-section ribs that are welded across the panel at intervals ranging from 12 to 17 in., depending on the style of wall panel being produced.

Gaging the intervals is done with pairs of notched wood templets cut out along one edge to clear the ribs. These ride along through the welding throat with the stock, one on each side of the panel, and are returned from the rear table by an operator who drops them into a gravity-return chute.

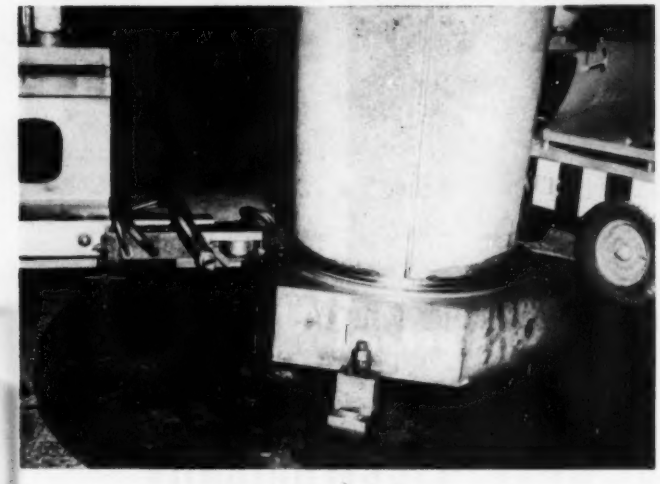
The mixture of control mediums was picked with top efficiency in mind. Along the top of the machine a carriage that supports the transformer is reciprocated by a hydraulic cylinder that is started, reversed, and stopped automatically through an electrical control panel. Hydraulic power was picked for steady, even pressure that would run the carriage without jerks.

There are 40 contacts directly under the carriage, each connected to a welding tip; thus sending current to a pair of tips in progression as the carriage traverses.

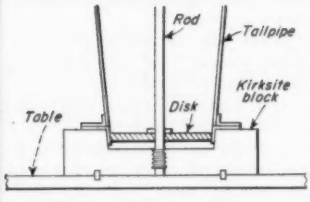
The tips are controlled by small hydraulic cylinders, one for each tip, which feed the tips down against the steel stock at the start of a cycle, and retract them after a cycle is completed. Hydraulic pressure was picked for this job because up to 600-psi tip-holding force can be exerted, and because the cylinders are quick-acting. All cylinders are extended before the carriage traverses, which holds the wall panel firmly during welding.

Although not built into the machine originally, an electronic control panel operates the welding equipment. The machine is rated at 200 kva, 440 volts, 60 cycles. Top welding speed is 100 cycles per minute, which can be provided either through the new electronic panel or the older electric panel, which has been retained as standby equipment.

Practical Ideas



Turntable Cutting Rig Replaces Vertical Turret Lathe



JET-ENGINE PARTS were being produced on all 13 of our vertical-turret lathes when an experimental job came through. This was a number of jet tailpipes which required flange-machining—normally a vertical-turret-lathe job. Instead of holding up production until a machine was clear, we improvised a rig on a husky turntable we had on a floor.

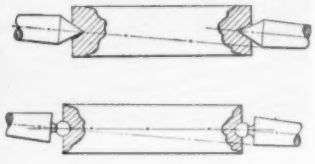
A Kirksite block, taper-bored to fit the small ends of the pipes, was blocked and clamped on the table exactly on center. Then, a tailpipe was mounted in it and was chucked internally by a wooden disk with tapered edges. This rode on a center rod that screwed into the Kirksite block and was controlled at the top of the pipe. As the rod was screwed deeper into the block, the disk tightened against the tailpipe to clamp it firmly.

A 10-ton surface plate on the floor next to the turntable held the turning tool that faced off the flange on the tailpipe. The plate held a gear-driven radius cutter with a toolbit mounted and ground so it would not approach a negative rake angle at any time as it was brought against the work. Rotating power was supplied to the turntable by one wheel of a single-wheel-drive Choreboy, which rested one rubber-tired wheel right on the table. *Solar Aircraft Co., San Diego, Calif.*

Spherical Centers Can Improve Taper Jobs

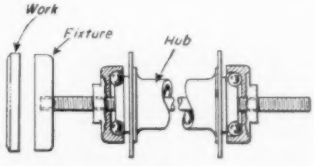
HERE'S AN IDEA that I've often thought about; and which I have expected to see, but never have. Why not make spherical centers for an engine lathe when tapering work is to be done?

Normal, cone-shaped centers don't fit the centerdrilled holes in a piece of stock when the tailstock is moved over for a tapering job. This causes lost power, ruined center holes, and damaged centers; aside from any inaccuracies in the turned surface caused by unwanted rubbing.



A set or two of spherical centers could be made; then a form tool to match the diameter of the sphere could be made to cut the ends of the work. The result would be a perfect support, no matter what the taper angle was.

As a matter of fact, the spherical centers could be used with ordinary centerdrilled holes in the stock, and would provide a much better bearing than conventional centers. *John Dernoga, Rochester, N. Y.*



Cycle-Hub Fixture Spins Buffing Work

SMALL PARTS like watch cases can be easily polished and buffed if an old bicycle hub—the kind with ball bearings at both ends—is fitted with a fixture to hold the parts. Regular spinners can be quite expensive, but this home-made kind is practically free if an old, broken bike is handy. The fixture can be screwed onto the end of the bolt that projects out of either end. Parts can be held without a clamp. *Frank Spicer, Dundee, Scotland.*

Bumping Method Straightens Bent Shafts

HERE IS an effective way to realign twisted and bent spindles and shafts. The work is first mounted on a lathe between centers or between a chuck and a center. The lathe should have ample capacity for the work.

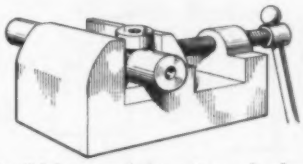
A large gas torch is turned on the bend to heat it to a bright red color as it rotates. A blunt bar is clamped in the toolpost, and this is advanced until it touches the work lightly. If the work is hot enough, and the bump is made carefully, the shaft will straighten immediately and will stay that way.

We repair bent motor shafts this way—even heavy ones—without damage to either shaft or lathe. *Borge Olsen, Ettriuk, Wis.*

Round Stock Provides Its Own Drill Bushing

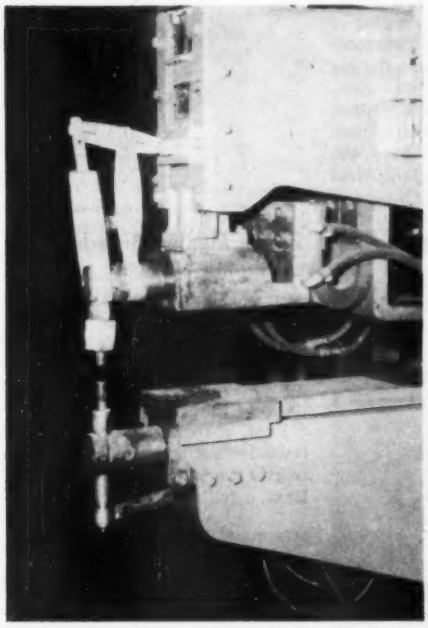
WHEN DRILLING a cross hole through round stock, here is a quick, accurate way to set up the job:

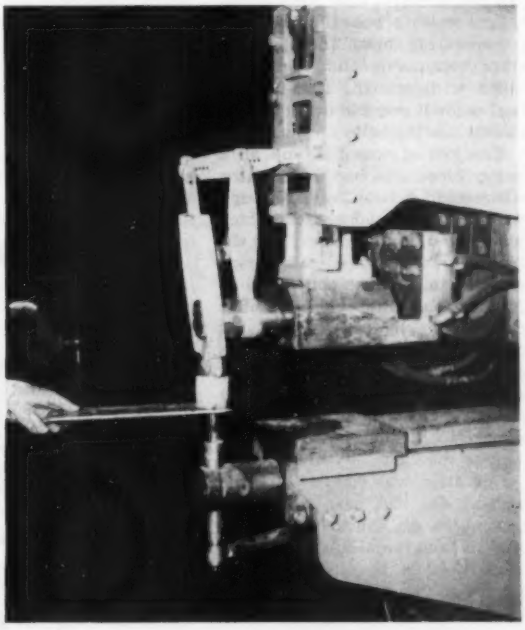
Chuck the round stock in a lathe and centerdrill it in one end. Then take the drill that will cut the cross hole ultimately and drill a blind hole about 3/8 in. deep into the end of the stock. Now tear down the lathe setup and cut a disk off the end of the stock to produce a washer. This washer should



be thick enough to act as a bushing for the drill.

The round stock is clamped in a vise with the washer (or drill bushing, which it becomes) on top of it. Chuck the drill in a drilling-machine spindle and drill the hole through the stock. *James K. Robison, Elmhurst, L. I., N. Y.*

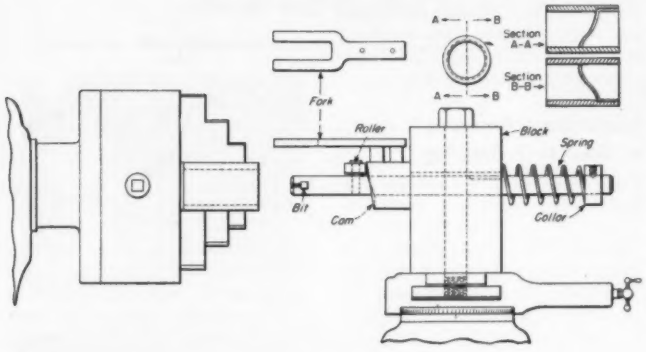




Electrode Guard Squelches Spotwelding Sparks

SOME STEELS are more likely to flash when welded than others, and for these cases a guard was designed, built, and installed on a spotwelder. The nuisance of spark flashes was eliminated, and it was possible for an operator to weld without goggle or clothing protection of any kind.

The guard is a copper collar with a collar of asbestos cloth attached to it. The guard slips up over the upper electrode, where it is held by a set of levers and brackets. The way these are designed, they raise the guard when the electrodes are separated, and drop it down when a spot is being joined. This allows the operator to see the tip of the upper electrode until the instant it hits the work. *A. Leclerc, Montreal, Quebec.*



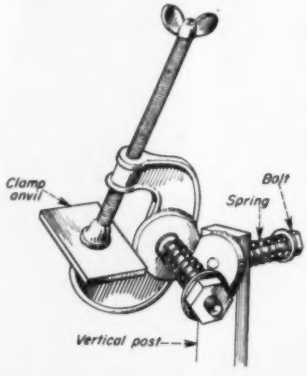
Boring-Bar Cam Shifts Tool To Cut Helical Groove

WE HAD A PRODUCTION JOB that required cutting helical grooves in some bearing shells. These grooves were continuous and were provided with straight lead-in slots that made it possible to get a lathe toolbit into the helix.

The tooling was built up on a heavy block attached to the lathe compound. A hole bored through the block took a boring bar, which was keyed to the block. At the rear of the bar, a collar was clamped to confine a coiled spring. At the front of the block, a collar cam (with the cam surface cut on the front edge of the collar) was mounted, and to this was attached a husky yoke that fitted closely around a chuck jaw. A roller was pinned to the boring bar to ride against the cam.

Operation was simple after the lead-in slot had been milled. A bearing was chucked — making sure it was rotationally aligned properly—and the slide was advanced to put the yoke around a chuck jaw. This put the toolbit at the deep end of the lead-in slot and in position to start cutting. At setup, the cam was rotated so the thinnest section of it was at the roller; insuring that the helix would be cut to the left of the end of the lead-in slit.

As the chuck rotated, the yoke and cam rotated with it, which moved the boring bar and toolbit back and forth to cut the helix. Spring pressure kept the roller firmly against the cam. Feeding of the tool was done with the cross-slide until full groove depth was reached. After the cut was completed, the machine was stopped and the boring bar was pulled out of the work as the slide was backed off. *Henry J. Gifford, New York, N. Y.*

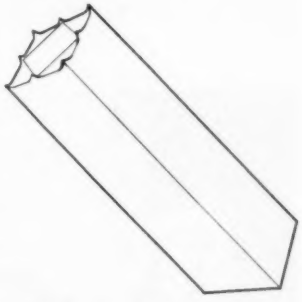


Welding Pedestal Shifts To Expose Work's Bottom

SMALL PARTS requiring beads on more than one side are easily welded up when mounted and C-clamped to this adjustable pedestal. The gadget consists of a two-lobe L-plate that is clamped to an upright bar on a bench.

A stud, welded to one lobe of the plate, is assembled through a hole in the upright with a spring and nut—allowing tightening the nut to prevent motion unless the L-plate is twisted by hand. A long clamp screw, to which is welded a flat plate, is held in a casting that assembles to the other lobe of the L-plate in the same manner. The two spring-loaded joints make it possible to shift the work (C-clamped to the plate on the end of the screw) to practically any position.

Ease of motion is adjusted by tightening or loosening the nuts that compress the two springs. *Olin L. Brage, Oroville, Wash.*

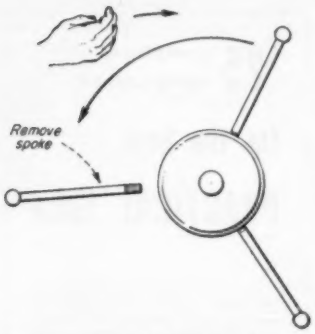


Simple Method Broaches Boring-Bar Hole

AFTER READING about so many ways to make a square hole through a boring bar to take a toolbit, I think it's about time I divulged my own method. It is simple; and it saves time as well.

First, a toolbit of the required cross-section is ground at one end to give the four corners an 8° rake. Next, a drill is picked with a diameter equal to $S + \frac{S}{7}$, where S is the thickness of the toolbit. Thus; a bit that is $\frac{3}{8}$ in. square would require a drill measuring 0.4285 or thereabouts. The hole through the bar is drilled at the angle required.

Now, the ground bit is broached through the hole with light and steady blows with a medium-weight hammer, curling up the chips in front of the four cutting corners of the bit. The result is generally a clean, straight hole that rarely requires filing. *John J. Moffatt, Montreal, Quebec.*



Remove Handwheel Spoke To Speed Drilling Job

SMALL, HAND-FED DRILLPRESSES can be made faster-operating with a simple idea that actually involves a bit of time-study and methods philosophy. The time spent by an operator, when drilling small parts in rapid succession, in picking the drillpress handle which he wants to grab can add up to quite a lot of time by the end of the day. When the drilling setup is made, it is possible for the setup man to remove one spoke from the handwheel to force the operator to pick the same spoke each time, thus simplifying the job.

The job should be arranged on the table, or the table should be adjusted in height, so the only available spoke lies about 20° behind the vertical, or within handy reach for starting each feed stroke. Then the operator has no need to change spokes in the middle of the stroke. *Dan Penway, Carlisle, England.*

Crush-Dressing Forms Surface-Grinder Wheel

A PLAIN surface-grinder wheel can be crush-dressed to a radius form to save considerable time when molds for plastic parts are being built. The dressing and grinding setups can be mounted together on the same table.

To crush a ⅜-in. female radius in the wheel, block a ¾-dia piece of cold-rolled steel or drill rod on the magnetic table parallel to the direction of travel. With the wheel standing still, engage it with the rod gradually to about a 0.004-in. depth (for a 46-grit wheel).

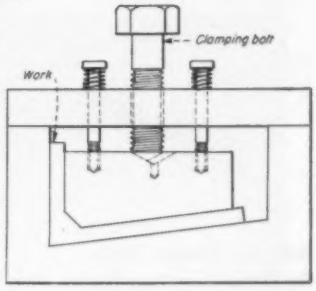
Now roll the wheel across the rod and back again; then rotate the wheel about a quarter turn and repeat until the whole surface has been formed. Next, advance the wheel the same amount and repeat. Brush the dust off the wheel after each pass to keep the wheel from loading up.

If a broken mold part is being replaced and some of the radius or angle form remains, we use this for crushing the form into the wheel. The process takes only a few minutes, and results in an accurate and long-lasting job. *Paul M. Smith, Cambridge, Ohio.*

Registering Fixture Clamps In Two Directions

MANY SHOP FIXTURES must clamp parts against two registering surfaces; with a single motion, if possible. Here is a way to make the fixture work without cutting bevels and matching the fixture components exactly or installing special clamps.

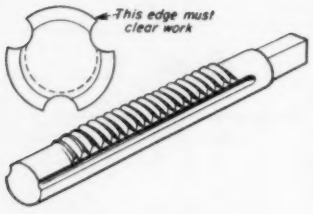
The fixture is assembled to hold the work, then a hole is drilled through the top plate to take a



bolt or thumbscrew that will clamp the part. A sample part should be placed in the fixture, and the clamping block loaded on top of the part. The drill is run in deeply enough to make a spot on the clamping block; then the block is removed.

Finally, a deep drill spot is machined in the top of the clamping block—but not on center with the original spot. This spot is offset slightly toward the registering surfaces of the fixture. When assembled in the fixture and clamped with a pointed bolt, the clamping block will be forced toward the registering surfaces; thus holding the part in register for machining operations. The spot should not be deep enough to form a square shoulder. *Robert Mery, Farmingdale, L. I.*

ROUTER fitted with end-milling cutter and holding fixture finish-cuts angle legs for F-89 Scorpions, eliminating hand-filing operations. The cutter is form-ground. *Northrup Aircraft, Inc.*



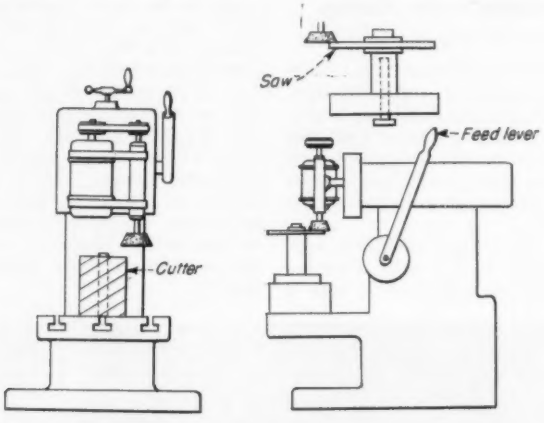
Internal Chaser Made By Removing Tap Flutes

ONE NIGHT I was working on a repair job, and needed a 9/16-18 tap. I couldn't find one at all, and had to adapt another size with the same thread to the job. By doing this, I found a good way to make a tap for any special diameter—as long as the thread that must be cut is a standard one for which a tap with approximately the same diameter is available.

The first thing to do was to grind off two complete flutes, leaving one intact. I did this with a 5/8-18 tap, and then ground off the remaining flute at the tip to leave a ½-in. pilot.

Starting the tap in the hole is not easy, as it may get skewed; but after the tap is in the hole and the ground-off flutes are bearing against the sides of the hole, the tap works just like an internal chaser. Careful use does as good a job as a full tap would do.

I have used this kind of tap in cast iron, mild steel, and bronze; all with good results, and with a saving in time on each job. *Frank M. Butrick, Jr., Alma, Mich.*



Shaper-Grinder Setup Forms Cutter Angles

END TEETH on cutters, shell end mills, and side teeth on saws and reamers can be accurately ground with a setup on a shaper. I mounted a Dumore grinder on an old Pratt and Whitney shaper, where the grinder on the toolhead could be swiveled 45° in each direction to grind both primary and secondary clearances.

The cutters are mounted on studs that are clamped in the T-slots of the shaper table. Thin cutters are held on studs with spacers inserted on the studs to build up the height. Saw blades are done the same way.

The complete grinding attachment is bolted to the toolhead; where it can be easily adjusted for any angle. Reciprocating is done with a long handle attached to the ram-driving spindle.

Using an old shaper for grinding cutters saves time and does a good job; leaving special grinder setups as is on our regular grinder. *Gordon Smith, Longmeadow, Mass.*

$25 *In addition to regular payment*

for the best

PRACTICAL IDEA

An extra payment of $25 will be made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT— $25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of the issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES — A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

REQUIREMENTS —Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author —every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

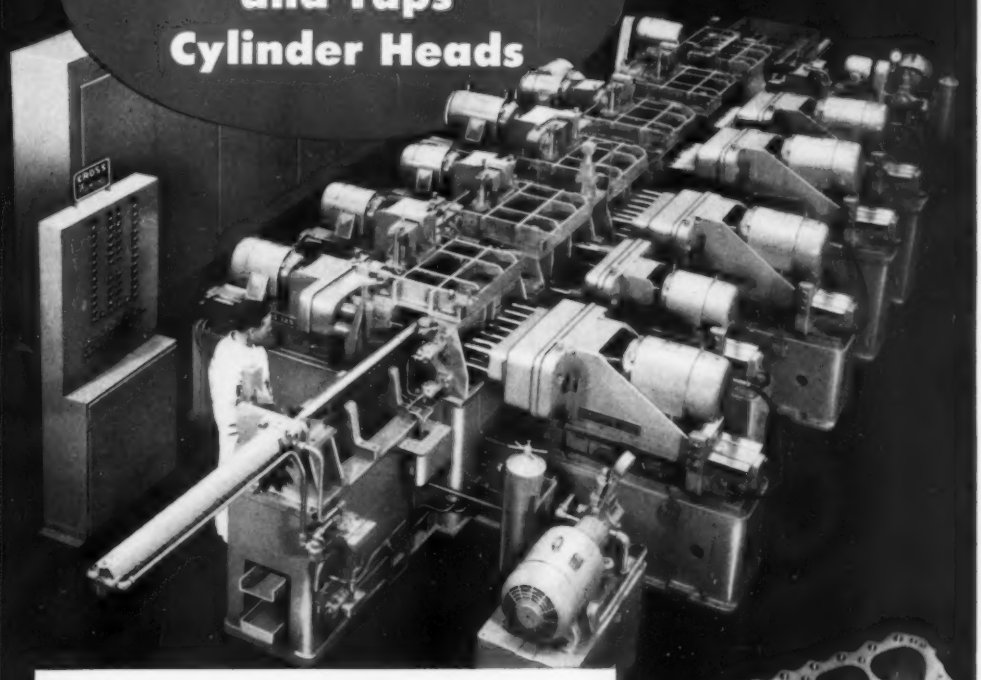
WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co., Inc., and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER— Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42d St., New York 18, N. Y.

120th Winners (Tie):
(For January 8, 1951)
Justo P. Ramirez
Shaper Makes Gear Cutter
Fred H. Lingenfelder
Friction End Mills

Another Transfer-matic by Cross

Drills, Chamfers, Reams, Spotfaces and Taps Cylinder Heads



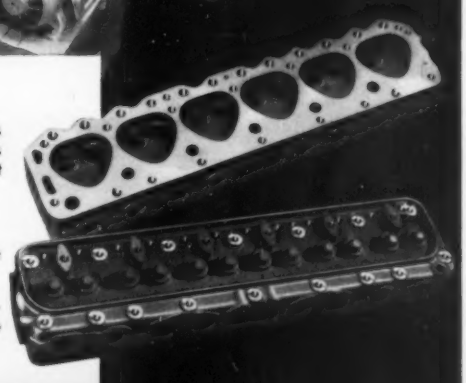
★ 100 pieces per hour at 100% efficiency.

★ Drills, chamfers and reams dowel holes; drills stud holes; drills push rod clearance holes; drills oil holes; drills, chamfers and taps rocker shaft bracket holes.

★ 8 stations with automatic part transfer.

★ Automatic depth inspection of holes before tapping.

★ Other features: pre-loaded spindle bearings—construction to J.I.C. standards—automatic chip disposal.



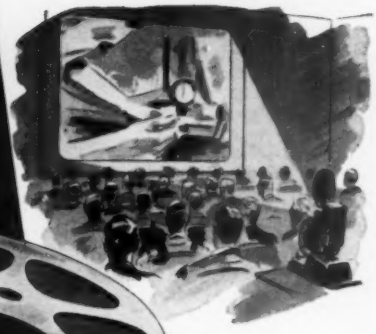
Established 1898

THE CROSS CO.

DETROIT 7, MICHIGAN

Special MACHINE TOOLS

Another Contribution To Better Precision Measuring
BY THE
WORLD'S GREATEST TOOLMAKERS



Educational, Instructive, Entertaining

A "MUST" FOR YOUR TRAINING PROGRAM

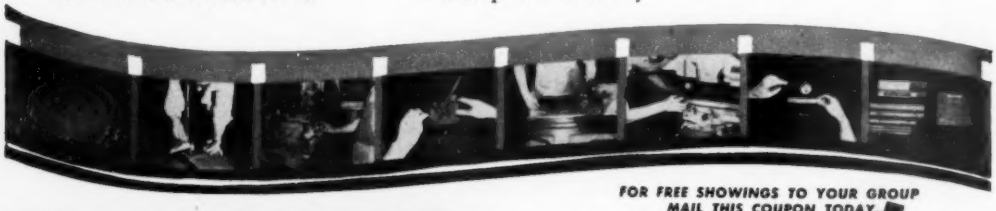
THE STARRETT 16MM SOUND MOVIE

"THE TOOLS AND RULES FOR PRECISION MEASURING"

FEATURING

- Highlights in the history of precision measuring
- New Tools and Instruments just introduced by Starrett
- Precision Measuring from basic rules to latest precision methods
- New, simplified instruction: How to use and read the Micrometer and Vernier

Here is a motion picture of vital interest to shop executives, mechanics, apprentices, vocational students — to all who play a part in modern precision production. Tells the absorbing story of precision measuring in 30 interest-packed minutes . . . how precision tools control quality in mass production . . . showing the latest methods and equipment in practical use. This inspiring, educational film will help everyone to do a better, faster job of precision measuring. It's a "must" for apprentice training and shop classes. Arrange today for a free showing to your group. Fill in the coupon. Mail it today.



FOR FREE SHOWINGS TO YOUR GROUP
MAIL THIS COUPON TODAY

TRADE MARK
Starrett
REG. U.S. PAT. OFF.

Standard of Precision
MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS · DIAL INDICATORS
STEEL TAPES · HACKSAWS AND BAND SAWS
PRECISION GROUND FLAT STOCK
Buy Through Your Distributor

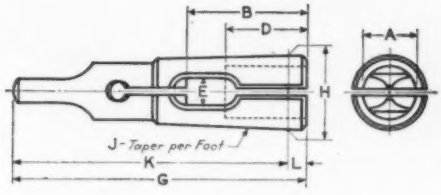
THE L. S. STARRETT COMPANY C
ATHOL, MASSACHUSETTS

Please arrange for our free showing of the new Starrett Movie

Type of Group.....Size.....
Name.....
Position.....
Company.....
Address.....
City.....Zone....State.....

Visit the STARRETT Exhibit • BOOTH No. 37 • AMERICAN SOCIETY FOR QUALITY CONTROL
5th National Convention • Cleveland, May 23-24

Drill Drivers...I



A tentative standard to be published by the American Society of Mechanical Engineers, N.Y. Sponsors are the Metal Cutting Tool Institute, the Society of Automotive Engineers and the National Machine Tool Builders Association, in addition to the ASME.

Split-sleeve collet-drill drivers are widely used in the automotive and other mass-production industries for driving straight-shank twist drills. Reasons for suitability of this type of driver are: multiple-spindle drillheads can be designed with spindles on close centers, and bushing plates do not have to be moved when drills must be replaced.

These drivers are listed in sizes from 0.0390 to 0.6875 in. to accommodate number, letter and fractional straight-shank twist drills from No. 61 to ½ in. and automotive-series drills from 0.2500 to 0.6875 in. (See ASA standard drill sizes: *AM*—Mar. 6, 1950, pp. 137 and 139. In sizes larger than ⅛ in. drill dia, the drill shank must be tanged for proper functioning. In singling out this design of drill driver, the standardizing bodies do not recommend it to the exclusion of all others.

Table 1 Taper Dimensions[1]

Taper Number	G	H	J	K	L
0[2]	2 3/8	0.356	0.62400	2 7/32	5/32
1	2 5/8	0.475	0.59858	2 7/16	3/16
2	3 3/16	0.700	0.59941	2 15/16	1/4
3	3 15/16	0.938	0.60235	3 11/16	1/4
4	5	1.231	0.62326	4 5/8	3/8

[1]Extract from American Standard Machine Tapers (ASA B5.10-1943; reaffirmed 1949).

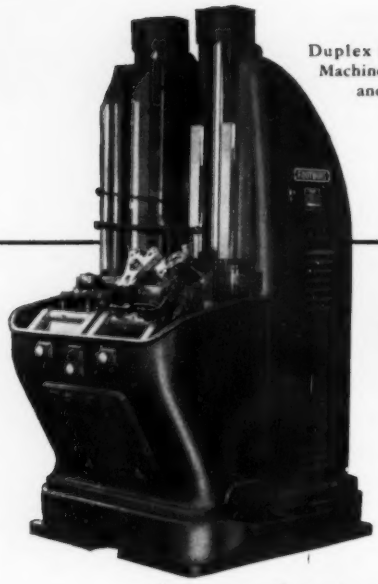
[2]Size 0 is not an American Standard but is included here to meet special needs.

Table 2 Dimensions of Drill Drivers

Size[3]	Standard Taper Number	Optional Taper Number	Optional Taper Number	Dimension B	Dimension D	Size[3]	Standard Taper Number	Optional Taper Number	Optional Taper Number	Dimension B	Dimension D
0.0390	1	0	....	7/16	....	0.1100	1	0	2	5/8	....
0.0400	1	0	....	7/16	....	0.1110	1	0	2	5/8	....
0.0410	1	0	....	7/16	....	0.1130	1	0	2	5/8	....
0.0420	1	0	....	7/16	....	0.1160	1	0	2	5/8	....
0.0430	1	0	....	7/16	....	0.1200	1	0	2	5/8	....
0.0465	1	0	....	7/16	....	0.1250	1	0	2	3/4	19/32
0.0469	1	0	....	7/16	....	0.1285	1	0	2	3/4	19/32
0.0520	1	0	....	7/16	....	0.1360	1	0	2	3/4	19/32
0.0550	1	0	....	7/16	....	0.1406	1	0	2	3/4	19/32
0.0595	1	0	....	7/16	....	0.1440	1	0	2	3/4	19/32
0.0625	1	0	2	7/16	....	0.1470	1	0	2	3/4	19/32
0.0635	1	0	2	7/16	....	0.1495	1	0	2	3/4	19/32
0.0670	1	0	2	7/16	....	0.1520	1	0	2	3/4	19/32
0.0700	1	0	2	7/16	....	0.1540	1	0	2	3/4	19/32
0.0730	1	0	2	7/16	....	0.1562	1	0	2	3/4	19/32
0.0760	1	0	2	7/16	....	0.1570	1	0	2	3/4	19/32
0.0781	1	0	2	7/16	....	0.1590	1	0	2	3/4	19/32
0.0785	1	0	2	1/2	....	0.1610	1	0	2	3/4	19/32
0.0810	1	0	2	1/2	....	0.1660	1	0	2	3/4	19/32
0.0820	1	0	2	1/2	....	0.1695	1	0	2	3/4	19/32
0.0860	1	0	2	1/2	....	0.1719	1	0	2	3/4	19/32
0.0890	1	0	2	1/2	....	0.1730	1	0	2	3/4	19/32
0.0938	1	0	2	1/2	....	0.1770	1	0	2	3/4	19/32
0.0960	1	0	2	9/16	....	0.1800	1	0	2	3/4	19/32
0.0980	1	0	2	9/16	....	0.1820	1	0	2	3/4	19/32
0.0995	1	0	2	9/16	....	0.1850	1	0	2	3/4	19/32
0.1015	1	0	2	9/16	....	0.1875	1	0	2	3/4	19/32
0.1040	1	0	2	9/16	....	0.1890	1	2	0	7/8	11/16
0.1065	1	0	2	9/16	....	0.1910	1	2	0	7/8	11/16
0.1094	1	0	2	9/16	....	0.1935	1	2	0	7/8	11/16

[3]See manufacturers' catalogs for sizes not listed.

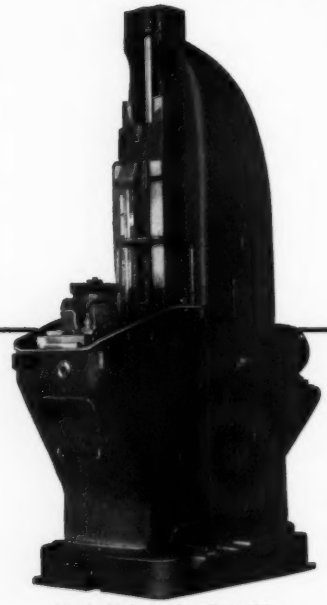
CONTINUED ON PAGE 129



Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

Continuous Type Broaching Machine. Made in 4 Sizes.

investigate surface broaching for difficult machine work



Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

● Many types of work can be surface broached on Footburt machines at remarkable savings over previous machining methods. High production is obtained with required accuracy and finish. Holding fixtures are designed for quick, convenient loading. Cutting tool maintenance costs are low. We will be glad to work with you on the application of surface broaching.

THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT surface broaching

. . . a time tested line of machine tools

Drill Drivers...II

Table 2 Dimensions of Drill Drivers *(Continued)*

Size[3]	Standard Taper Number	Optional Taper Number	Optional Taper Number	Dimension B	Dimension D
0.1960	1	2	0	7/8	11/16
0.1990	1	2	0	7/8	11/16
0.2010	1	2	0	7/8	11/16
0.2031	1	2	0	7/8	11/16
0.2040	1	2	0	7/8	11/16
0.2055	1	2	0	7/8	11/16
0.2090	1	2	0	7/8	11/16
0.2130	1	2	0	7/8	11/16
0.2188	1	2	0	7/8	11/16
0.2210	1	2	0	7/8	11/16
0.2280	1	2	0	7/8	11/16
0.2340	1	2	0	7/8	11/16
0.2344	1	2	0	7/8	11/16
0.2380	1	2	0	7/8	11/16
0.2420	1	2	0	7/8	11/16
0.2460	1	2	0	7/8	11/16
0.2500	1	2	0	7/8	11/16
0.2520	1	2	0	1	25/32
0.2570	1	2		1	25/32
0.2610	1	2		1	25/32
0.2656	1	2		1	25/32
0.2660	1	2		1	25/32
0.2720	1	2		1	25/32
0.2770	1	2		1	25/32
0.2812	1	2		1	25/32
0.2854	1	2		1	25/32
0.2900	1	2		1	25/32
0.2913	1	2		1	25/32
0.2950	1	2		1	25/32
0.2969	1	2		1	25/32
0.3020	1	2		1	25/32
0.3071	1	2		1	25/32
0.3125	1	2		1	25/32
0.3160	1	2		1 1/8	7/8
0.3230	1	2		1 1/8	7/8
0.3281	1	2		1 1/8	7/8
0.3320	1	2		1 1/8	7/8
0.3390	1	2		1 1/8	7/8
0.3438	1	2		1 1/8	7/8
0.3480	1	2		1 1/8	7/8
0.3543	1	2		1 1/8	7/8
0.3580	1	2		1 1/8	7/8
0.3594	1	2		1 1/8	7/8
0.3680	1	2		1 1/8	7/8
0.3750	1	2		1 1/8	7/8
0.3770	2	3		1 1/4	15/16
0.3860	2	3		1 1/4	15/16
0.3906	2	3		1 1/4	15/16
0.3970	2	3		1 1/4	15/16
0.4040	2	3		1 1/4	15/16
0.4062	2	3		1 1/4	15/16
0.4130	2	3		1 1/4	15/16
0.4219	2	3		1 1/4	15/16
0.4375	2	3		1 1/4	15/16
0.4531	2	3		1 1/4	15/16
0.4688	2	3		1 1/4	15/16
0.4844	2	3		1 5/16	15/16
0.5000	2	3		1 5/16	15/16
0.5156	2	3		1 5/16	15/16
0.5312	2	3		1 5/16	15/16
0.5469	2	3		1 5/16	15/16
0.5625	2	3		1 5/16	15/16
0.5781	3	4		1 15/32	1 1/32
0.5938	3	4		1 15/32	1 1/32
0.6094	3	4		1 15/32	1 1/32
0.6250	3	4		1 15/32	1 1/32
0.6406	3	4		1 15/32	1 1/32
0.6562	3	4		1 15/32	1 1/32
0.6719	3	4		1 5/8	1 1/8
0.6875	3	4		1 5/8	1 1/8

[3]See manufacturers' catalogs for sizes not listed.

GENERAL SPECIFICATIONS

INSIDE DIAMETER *A*:
From (0.0390) to 5/32 (0.1562), incl.
Min = nominal minus 0.0010
Max = nominal
Above 5/32 (0.1562) to 1/4 (0.2500), incl.
Min = nominal minus 0.0015
Max = nominal minus 0.0005
Above 1/4 (0.2500) to 1/2 (0.5000), incl.
Min = nominal minus 0.0020
Max = nominal minus 0.0010
Above 1/2 (0.5000) to 11/16 (0.6875), incl.
Min = nominal
Max = nominal plus 0.0010

CONCENTRICITY OF HOLE *A*:
The bore and shank shall be ground concentric within 0.002 in. total indicator reading, gaged at a distance equal to the projection of a standard drill from the chuck.

CONCENTRICITY OF DRIVING SLOT *E*:
From 0.106 to 0.259, incl. = 0.005 total indicator reading
Above 0.259 to 0.534, incl. = 0.007 total indicator reading
Above 0.534 to 0.6875, incl. = 0.008 total indicator reading

WIDTH OF DRIVING SLOT *E*:
From 0.1250 to 0.1875 in., inclusive—0.106 min.; 0.110 max.
From 0.1890 to 0.2500 in., inclusive—0.134 min.; 0.138 max.
From 0.2520 to 0.3125 in., inclusive—0.174 min.; 0.178 max.
From 0.3160 to 0.3750 in., inclusive—0.215 min.; 0.219 max.
From 0.3770 to 0.4688 in., inclusive—0.255 min.; 0.259 max.
From 0.4844 to 0.5625 in., inclusive—0.317 min.; 0.323 max.
From 0.5781 to 0.6562 in., inclusive—0.387 min.; 0.393 max.
From 0.6719 to 0.6875 in., inclusive—0.457 min.; 0.463 max.

OVER-ALL LENGTH *G*:
Plus or minus 1/32 in.

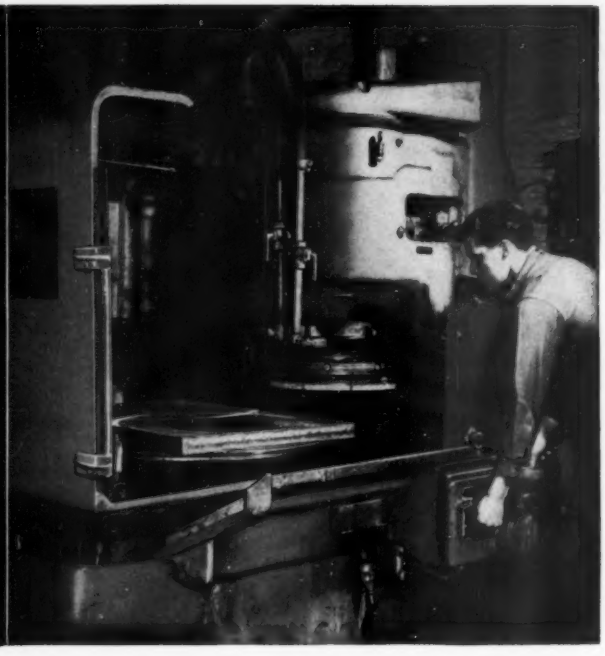
DIAMETER at GAGING NOTCH *H*:
Plus 0.002, minus 0.000 in.

MATERIAL:
Chrome-nickel steel, SAE 3135 or equivalent

ROCKWELL HARDNESS:
C-48 to C-50

TAKE A LESSON FROM THE BIG USERS...

SPECIFY ROBERTSON SEGMENTS FOR YOUR BLANCHARDS



Many manufacturers learn about the superior qualities of Robertson Segments for the first time when they try them out on difficult surface-grinding operations. Whether they are working on tiny thread chasers, or 30″ x 30″ boiler plate, they soon find they can count on Robertson to increase production substantially and make a corresponding decrease in power and wheel costs.

One large company, for instance, was grinding forged steel discs 11½″ in diameter and .700″ thick. To reduce thickness to .438″, .262″ stock had to be removed. With a conventional wheel, the plant averaged six pieces every five hours—the equivalent of 24 pieces per set of segments. When a Robertson Segmental Wheel WA-243-I-2V was substituted on this job, down-feed was increased to .012″ per minute and six pieces were finished-ground every two hours. Fifty-four discs were ground with each set of Robertson Segments. Ampere reading never went above 65–70. More than twice as much wheel life . . . plus the ability to greatly increase production.

Another company, operating on 30″ x 30″ boiler plate, was taking 45 minutes to remove .050″ stock from one side. Ampere reading was 65–75. Equipping the Blanchard with a Robertson Cool-Cut Segmental Wheel, this producer cut grinding time down to 20 minutes. Feed was stepped up 25 percent. Ampere reading dropped to 45–50.

Every day, in hundreds of plants throughout the country, and in dozens of grinding applications, Robertson Wheels turn in similar great performances. Let a Robertson Engineer show you how you can get results like these right in your own plant. Write on your business letterhead for a demonstration.

Today, some of the country's largest manufacturers are using Robertson Wheels and Robertson engineering services. Their names will be sent on request.

ROBERTSON MANUFACTURING COMPANY

TRENTON 5, NEW JERSEY

Resin-Bonded and Vitrified-Bonded Grinding Wheels • Mounted Wheels • Segments

Grinding-Machine Sizes

Proposed American Standards for the designation and working ranges of surface and cylindrical grinders have been developed by these sponsor organizations: National Machine Tool Builders Assoc., Society of Automotive Engineers, Metal Cutting Tool Institute, and the American Society of Mechanical Engineers. When designated as American Standards, the material will be published by the ASME.

Plain Cylindrical Grinders

Scope. This standard applies to all swings of plain cylindrical grinders up to and including the 36 in. size (dia).

Size. The size of a cylindrical grinder shall be the nominal swing over the table and the nominal distance between centers in inches.

Wheel Hole Sizes. On all sizes of plain cylindrical grinders, 5-, 8-, 12- and 20-in. dia of hole shall be considered standard. Where the 8-in. hole size is included as standard, it is to be considered as applying to present and old designs of machines. In the design of all new machines, 5-, 12-, and 20-in. dia are to be considered standard sizes and every effort made to confine design to these sizes.

Swing. Actual swing shall be less than 1 in. greater than standard nominal swing, regardless of the length, up to and including the 16-in. swing. On 20-in. swing and larger machines, the actual swing shall be less than 1½ in. greater than the standard nominal swing, regardless of length. The 1-in. allowance refers to diameter and not to radius.

Length. Length shall be measured as the distance between the faceplate and the center receiving end of the foot-stock spindle, such measurement to be taken with the headstock and footstock flush with the ends of the table and with the spindle of the footstock extended toward the headstock 1 in. from the extreme back position. Actual length shall be the standard nominal length, plus half the standard nominal swing. The tolerance of the actual length shall not exceed one-sixteenth of the standard nominal swing. For instance, the length of a 10 × 48-in. machine is calculated as follows:

Standard nominal length	48 in.
Plus ½ of standard nominal swing (10 in.)	5 in.
Tolerance, 1/16 in. of 10 in.	⅝ in.
Maximum actual length, including tolerance	53⅝ in.

Nominal Swing. The standard nominal swing of all plain cylindrical grinders shall be 3, 4, 6, 10, 14, 16, 20, 24, 28, 32, and 36 in. The size relates to the diameter of the work possible to swing in the machine, and not to the radius of swing.

Nominal Length. Standard nominal lengths shall be 12, 18, 30, 36, 48, 72 in., and longer by intervals of 2 ft. The length shall be related to the swing as follows:

Swing, In.	Length, In.
3	12, 18
4	12, 18
6	18, 30
10	18, 36, 48, 72*
14	18, 36, 48, 72*
16	36, 48, 72*
20	96*
24	96*
28	96*
32	96*
36	96*

* and longer by intervals of 2 ft

Machine Serial Number. The serial number of each machine shall be clearly designated as the serial number and shall be stamped, together with the size designation, on a pad or plate provided for that purpose.

Surface Grinders

Scope. This standard applies to all sizes of reciprocating table surface grinders having horizontal spindles.

Size. The size of a surface grinder of the reciprocating table type shall be the dimensions of the table working surface.

Wheel Sleeve Diameters. Standard diameters for wheel sleeves shall be: 1¼, 3, 5, 8, and 12 in.

Width of Working Surface. The length of table working surface shall be standardized at 5, 6, 8, 10, 12, 16, and 20 in.

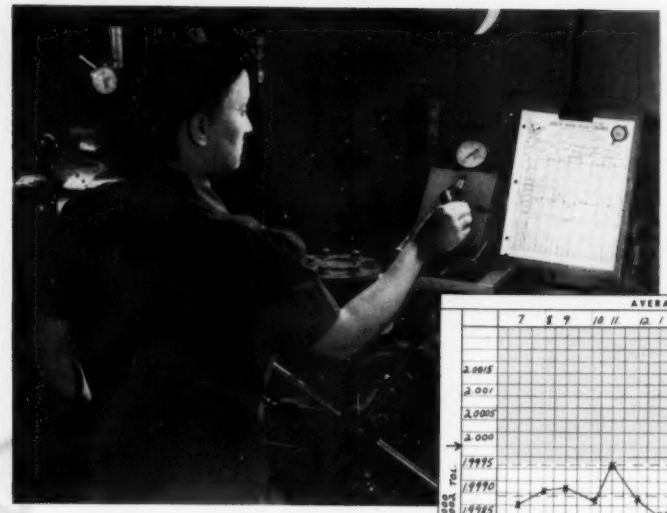
Length of Working Surface. The length of table working surface shall be standardized at 12, 18, 24, 36, 48, 60, and 72 in., and in increments of 24 in. above 72 in.

Longitudinal Travel. Maximum longitudinal travel shall be not more than the length of table working surface, plus half the diameter of the standard wheel, plus 1 in.

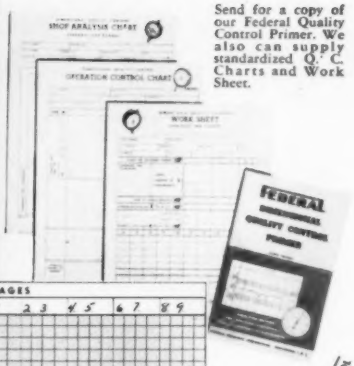
Transverse Travel. Maximum transverse travel shall not be more than the standard width of table working surface, plus width of standard wheel, plus ½ in.

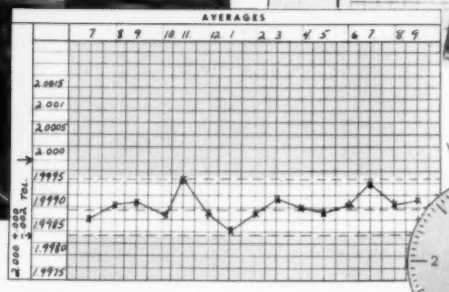
Vertical Travel. Maximum distance from top of table to center of spindle shall not be greater than the following amounts:

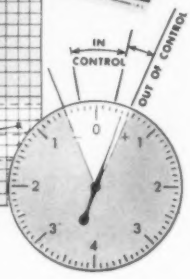
Working Surface Width, In.	Vertical Distance to Center of Spindle, In.
5	12
6	14½
8	17½
10	20½
12	23½
16	27½
20	35½



Send for a copy of our Federal Quality Control Primer. We also can supply standardized Q. C. Charts and Work Sheet.







In Dimensional Quality Control . . . It's Federal FIRST and FOREMOST

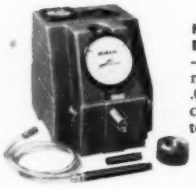
Federal, in 1945, was the first to widely support the application of Statistical Quality Control Methods to Dimensional Control. Over 60,000 copies of our booklet, the "Federal Quality Control Primer", have been supplied to companies and educational institutions. More than 1200 men from Maine to California have taken Federal's five-day Quality Control Course. And many individuals and concerns have received on-the-job assistance from Federal in this new economic production tool.

No longer is dimensional gaging looked upon as an expense. Rather, it is now considered a scrap- and cost-saving procedure which assures a better product at lower production cost.

Federal Indicating Gages continue to play a vital part in the advancement of Quality Control. Major industries and government agencies today demand greater product uniformity than is possible with fixed or old-style gages. Everyday, prime and sub-contractors are coming to Federal for the right dimensional gages to make their work *right the first time.*

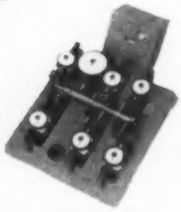
Federal's exceptional experience in designing and applying *indicating* type gages to Dimensional Control is well worth your consideration. Let us show you how you can save man and machine-hours, and scrap . . . at the same time you are producing better dimensional quality. Write FEDERAL PRODUCTS CORPORATION, 1124 Eddy Street, Providence 1, Rhode Island.

DIAL INDICATOR GAGES — Only indicating gages can show what is happening to dimensions.



NEW FEDERAL DIMENSIONAIR — outstanding wide range (.003") reads .00005" directly, exceptionally stable, faster to set.

ELECTRICAL AND ELECTRONIC GAGES — for faster sampling of multiple-dimensions and for continuous measuring and automatic sorting.



See us at Booth #20 at the American Society for Quality Control Convention in Cleveland Auditorium.

FEDERAL

Largest manufacturer devoted exclusively to designing and manufacturing *all types* of DIMENSIONAL INDICATING GAGES

TALKING SHOP

Nipples

ONE OF AMERICA'S largest users of nipples for baby bottles is Delco-Remy Div. of GM. Application: to mask terminals of automobile starting motors during painting. Present use is 42,000 nipples a year.

Snifter

HALIDE GAS is used on one automobile to operate a gage dial. Minute leakage in service required many replacements, but immersion and other inspection methods showed no leakage, nor did keeping shelf stocks for a time develop any pressure drop. Finally, a GE "snifter" unit was applied. It has a ¼-in. tube connected with a special gas in a container, and electrical connections to an amplifier and loudspeaker. One molecule of escaping halide gas causes an immediate squawk in the speaker and localizes the leak. Service replacements now are negligible, the "snifter" catching 4% of the "perfect" gages passed by normal inspection.

Moral Educator

THE MACHINE is a great moral educator . . . If a horse or a donkey refuses to go, man loses his temper and beats it . . . If a machine does not work, there is no alternative but *to reason out what is wrong.* That is real education.—*Gilbert Murray.*

Escape Ingenuity

TIN CANS, supplied to prisoners of war in Red Cross food packages, were the raw material of an extensive metalworking industry in World War II. Flying officers from Allied countries, imprisoned in German camps, used them as the basis of most of their tunneling escape attempts, according to R.A.F. Lt. Paul Brickhill, in "The Great Escape" (Norton $3). The cans provided pipelines for air at the tunnel face, also tires for tunnel buggies—even tubes for stills to distill raisin whiskey. Cold chisels, wood chisels and other tools were filed out of bits of metal with pieces of file bribed from guards. The metal itself frequently was taken from the huts or hut furnishings. Even an auger bit was thus filed out.

Wire clippers were made from the very soft steel of hut tie bars, riveted together. Cutting notches were hardened by pouring a little sugar on the heated metal, then reheating so the surface absorbed carbon. When this was quenched, it became hard enough to cut steel. Cold chisels were similarly surface-carburized and tempered. A wood saw was made by filing teeth in a salvaged clock spring.

Compass cases were molded from broken phonograph records, the pivot a phonograph needle, and the compass needle a bit of sewing needle with a socket soldered on with solder from the tin cans and resin from building walls or trees as a flux. Some 250 compasses were thus made. Solder from the cans, cast in soap molds, made belt buckles and medals for fake German uniforms.

There were dozens of other engineering and shop kinks bred of necessity—enough to make an absorbing 264-page book merely to summarize them. If you want to learn how "know-how" works in adversity, here's your story.

Batting Average: .100

GM LABS reports that only one of each ten research projects is successful, reminds us that Edison's old statement is still true; it's just as important to know what *won't* work.

Daffynitions

EARTH: huge ball revolving on its taxes . . . ELECTRIC BLANKET: gadget that encourages sleeping at the switch . . . PARIS GOWN: keeps her breathless, him speechless . . . LUMBERJACK: wooden nickels . . . JOINT PROMOTION: bar advertisement . . . WRESTLING: brute farce . . . CONVERSATION: mutter cycle . . . ACCORDION: gadget a ticklish fellow can't stomach . . . SHORT-TEMPERED BOSS: crabitalist . . . PUN: sagsimile . . . GIZMO: gimmick to improve a gadget . . . BUSY BRIDGE: car-spangled spanner . . . COLD WAR: Marshall Plan to martial plan . . . THEORY: hunch with a college degree . . . VACATION: Bad quarters that cost good dollars.

Old-Timer

CHARLES H. BERNHOLZ, leadman in the grinding department of the Engine Division, Fairchild Engine & Airplane Corp., recently acquired a small micrometer about 2 in. long. Inspection indicates that, although it was made by Brown & Sharpe 84 years ago (and called a "pocket sheet-metal gage"), it is still accurate to within 0.0002 in.

Burr Brush

TO REMOVE BURRS from the lobed bore of a hydraulic-pump rotor (flat, circular piece) one maker has developed a special wire-brushing machine. Brushes in a plane at right angles to the work remove the burr as the rotor is rotated, without creating a radius on either face.

Licensed Shop Men

STATE LICENSING LAWS, sound enough in their place, are standing in the way of progress in Metalworking. Cases in point: Massachusetts has a state law prohibiting use of a hypodermic syringe by anyone not licensed. Yet an ordinary syringe is the best available tool for applying a metered amount of lubricant to an instrument bearing. . . . Many states are restricting the use of explosive stud drivers and riveters—which utilize a powder charge for driving or expanding force—to licensed hunters.

Reminds us of the tale of the two young schoolteachers who were arrested while sightseeing on an "off-limits for ladies" street in a Mexican town. Their local lawyer finally convinced them that it was far cheaper—even if reputation-damaging in the U. S.—to take out a license for $2 rather than to pay a fine of $30.

News of Metalworking

McGraw-Hill WORLD NEWS

NEW SMALL CAR — The Protek Co. for Industrial Development, Tuttlingen (French zone of Germany), hopes to start production of a new miniature car in late spring. Called the "Trippel SK 10," the car has a 500cc two-cylinder, four-stroke "Boxer" engine, mounted at the rear. Gasoline consumption is 100km per 3.5 litre. The car cruises at 80 kph, and has a maximum speed of 110kph.

TO PUSH OUTPUT — East German Parliament has adopted a law for the first year of the five-year plan to speed up industrialization of East Germany, aimed at doubling present industrial output by 1955. One aim is to build up a large and effective heavy industry, mainly for production of machine tools, electric motor, mining equipment, transport equipment, and merchant ships.

STUDY STEEL WORKS—Egyptian Ministry of Commerce & Industry is studying establishment of a steel works with capacity of 150,000 tons of steel per year. Six foreign firms (three German, one French, one Italian and one American) have already submitted bids.

LOAN EXHAUSTED — The $100-million loan granted to Australia by the World Bank has been exhausted, for all practical purposes. So far, more than $75 million actually has been used and the remainder is earmarked for earth-moving equipment, tractors, farm equipment, electricity-generating plant and railway equipment.

BUY RAIL EQUIPMENT—Orders for railway passenger and freight cars, locomotives, rail and shop machinery, to the value of 500-million pesos have been placed in Europe and the U.S. by Mexican National Railways. Purchases from the U.S. will be financed out of a $150-million credit granted to Mexico by the U.S. Export-Import Bank last autumn. Equipment from the U.S. includes 67 passenger coaches, 1600 freight cars, and 70 diesel locomotives.

Congress Passes New Version of World War II Renegotiation Law

WASHINGTON—A new version of the World War II renegotiation law has been passed by Congress. And in it there's a brand-new provision affecting the makers of machine tools and other "durable productive equipment."

During World War II, there was no special provision for the makers of machine tools. They were renegotiated on defense business in the same way and to the same extent as any other manufacturer working on government contracts or subcontracts.

And this is still true under the "Renegotiation Act of 1951" of sales made to the government, or for the government's account. But there's a partial exemption from renegotiation on income that's done for subcontractors who are buying tools for their own account, not the government's.

• **Here's the technical language** as explained by the conference committee, which wrote the final version of these provisions on production equipment.

"This amendment provides that in the case of any subcontract for durable productive equipment, not purchased for the account of the United States, renegotiation shall apply only to that fraction of the receipts or accruals from such subcontract which 5 years is of the average useful life of the equipment."

Here's an example, somewhat simplified, of what this provision means.

Supposing you sell enough machine tools to contractors or subcontractors—who are taking title to these tools—to bring you within the scope of coverage of the new renegotiation law; that is, more than $250,000 worth of renegotiable business. Supposing you do $400,000 worth of such business, and that the average useful life of the tools involved is 10 years. Thus, under the formula, you are renegotiable on five-tenths of this business, or $200,000.

Generally, the new law has other provisions, too, that distinguish it from the World War II method of handling renegotiation. First of all, the law set up an independent Renegotiation Board of five members, at least three of which must be civilians. This new top authority is Congress' answer to the feeling that military renegotiation boards have been too closely associated with the procurement officials who negotiated the contracts in the first place.

• **There's a long list of contractors** and subcontractors who are exempt from renegotiation completely — producers of many agricultural and mineral commodities, for instance, and anyone whose government business amounts to less than $250,000 per year. On World War II contracts, you weren't covered until you did $500,000 of defense business.

The new Renegotiation Board also has the authority to exempt, at its discretion, contracts which it finds by their own terms rule out the possibility of excess profits. It can exempt these either by classes of contracts, or by individual contracts. Also, the board can exempt any contract which does not have "a direct and immediate connection with the national defense." However, this language was loosened up by the lawmakers to the point where almost any subcontract—for steel, for instance — could be interpreted as having "a direct and immediate connection with national defense."

Tell Military Role in Handling

CHICAGO — "The Military Importance of Materials Handling" will be discussed by Rear Adm. M. L. Ring, director of supply management, Munitions Board, at the American Material Handling Society's Conference on Materials Handling to be held here April 30-May 4 in conjunction with the National Materials Handling Exposition.

To Hold Electrification Forum

PITTSBURGH — The 1951 Machine Tool Electrification Forum, sponsored by Westinghouse Electric Corp., will be held here April 10-11 at the William Penn Hotel.

Machining of Titanuim Studied

OAKLAND, Calif. — Many of the machining problems involved in using titanium will be clarified within the next few months, panel discussions on substitutions for and conservation of scarce metals at the Seventh Western Metal Congress & Exposition here in mid-March indicated.

George Fraser, of Rem-Cru Titanium, Inc., commented that increases in yield strength of titanium were being accomplished through changes and improvements in manufacturing techniques, without changing existing alloy proportions.

In describing tooling techniques used in machining the new metal, he reported that the best results were obtained by roughing off with high-speed steel or cast alloy at speeds from 20 to 40 fpm taking as heavy a feed as possible, with a minimum of 0.030 in.

Some users of the metal have been able to finish machine satisfactorily with carbide tools at 250 surface fpm, he said, with a minimum feed of 0.015 in. A good positive feed should be maintained, with a minimum of at least 0.015, and the tool should not be allowed to dwell too heavily on the work. Dry machining is recommended, so that the scrap metal can be reclaimed in a pure state.

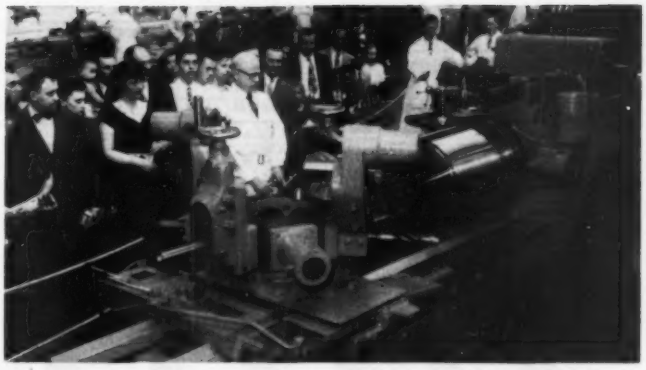
Speaking on extending the potential supply of high-speed steels, Ralph L. Wilson, director of metallurgy for Timken Roller Bearing Co., said that "once we get a higher output of molybdenum—which was cut back during the war—we might take the tungsten out of most of these steels and substitute 8 to 9% molybdenum and raise vanadium to 3 or 4%."

• **Columbium could be conserved,** he believes, by using titanium to stabilize certain stainless steels, and that a higher tantalum content in such alloys as 347 might also serve to conserve the scarce columbium.

He was unsympathetic, however, to "defiling" stainless steels, believing it wiser to make careful studies of the end uses for scarce alloys, and allot them to those uses considered most essential.

Calling for more "education" in the proper use of alloy steels, Fred J. Robbins, president, Sierra Drawn Steel Corp., Los Angeles, declared that alloy users, instead of talking about what they want should talk about what they need to do a job.

"We are wasting alloys by carelessness," he said, "by not tailoring our specifications to field service requirements. We've just added alloys to cover up lousy heat treatment."



RECRUITMENT of new workers was one of themes of first Warner & Swasey employees' open house in eight years. Elaborate working exhibits featured Warner & Swasey machine tools, including the big 4-A shown here, textile machinery, and the Gradall multi-purpose earthmover—all borrowed for the occasion from busy assembly lines

Manpower Shortage Increases Out-of-Area Recruiting of Labor

WASHINGTON—Out-of-area recruiting has increased because of the tightening manpower shortage, but it is hampered by the over-all shortage of metalworking skills and the lack of adequate housing.

Metalworking firms in Connecticut and aircraft plants in the Paterson, Phoenix, Wichita, Los Angeles, San Diego, Dallas and Seattle areas have placed large orders for skilled and semi-skilled workers with the U. S. Employment Service. But USES can't find the skills, and many employers send out their own recruiting teams.

At the same time, there is some reconversion unemployment which is not a general problem, but is felt by individual workers and plants. Through its newspapers, the AFL has instructed its local unions to cooperate with employers in getting relief from NPA when metal cutbacks endanger jobs.

• **Without a pool of skilled workers** to draw on, many employers find lengthening of the work week necessary and the easiest step toward meeting production demands. Mobilizer Charles E. Wilson favors a longer work week to, say, 44 hours for all defense work. A 48-hour week has become common, particularly in aircraft. Frank P. Graham, the Labor Dept.'s new Defense Manpower Administrator, will oppose — with strong labor backing—any move to kill overtime after 40 hours.

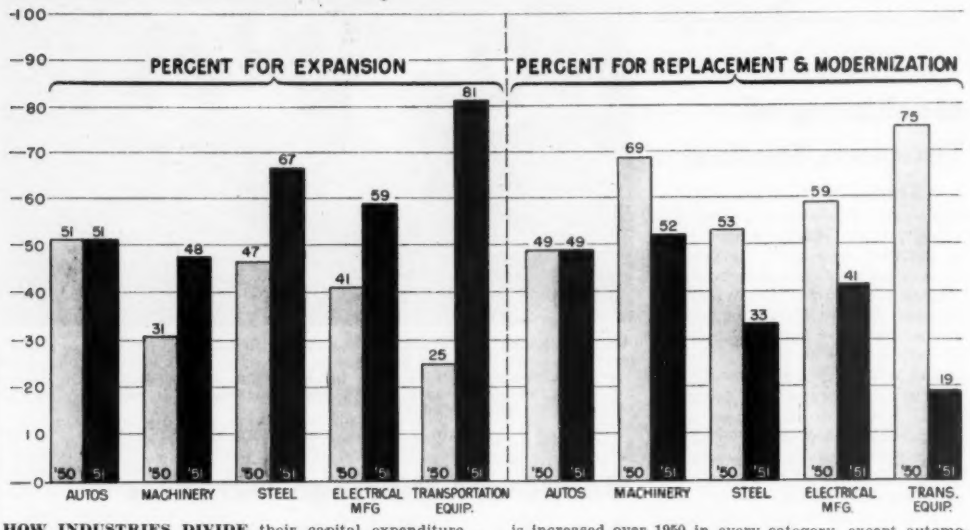
Few plants are putting on extra shifts because the labor and the skills needed are not available.

Other steps being taken to alleviate manpower stringencies:

More in-plant training: Glenn L. Martin has extensive program. Pratt & Whitney has converted unused factory into training school for production workers.

Upgrading: As employment expands and workers are trained, more are upgraded into higher-skilled jobs.

Lower hiring specifications: More older workers are hired; more women are filling men's jobs.



HOW INDUSTRIES DIVIDE their capital expenditure dollars between expansion and replacement and modernization is shown in this chart. The percentage for expansion is increased over 1950 in every category, except automobiles, where there is no change

Manufacturers Plan Record Expansion for Mobilization

NEW YORK — To meet the production challenge of mobilization, American industry is planning an unprecedented expansion of its productive capacity this year, it is revealed by McGraw-Hill's fourth annual survey of business' plans for new plants and equipment, providing the first direct measures of the growth of American industrial facilities.

This is a continuing wave of expansion. In the last year, manufacturing industries raised their capacity 7%. Since 1939, in meeting the production requirements of war and peace, these industries have raised their capacity 75%.

To increase capacity 9% in 1951 manufacturing industries would like to spend $13.3 billion. That is 66% more than they actually invested in new plants and equipment in 1950 and by far the largest expenditure ever planned for one year.

All industry — railroads, utilities, other transportation and communications and mining, as well as manufacturing — plans to invest a grand total of $21.5 billion in 1951. This is 45% more than was actually invested in 1950.

• **This is not a forecast** of what 1951 capital investment will actually be. The $21.5 billion total represents industry's *plans* to invest in new plants and equipment, as reported to the McGraw-Hill Department of Economics in January. The survey shows what business wants to do—if the materials, equipment, and manpower are available.

Industry's 1951 plans reflect the nation's needs for increased production to meet mobilization demands. Industry is expanding its facilities to meet both military needs and booming civilian demand. But the big emphasis is on mobilization needs.

The aircraft industry is expanding its facilities more than 40%. Here capacity — difficult to define and measure at best — means something different than it did in World War II. One aircraft company, for example, may still have the capacity to produce 10,000 World War II-type planes a year. But it may need to spend millions on new facilities before it can turn out 5,000 jet-propelled fighters today. Industry estimates show that new planes may require as much as four times the machining that their World War II counterparts did.

The electrical and general machinery industries have similar difficulties. Their products have changed—become heavier, higher-powered, and with much more precise control equipment.

To overcome these difficulties McGraw-Hill, in making its surveys, has asked all companies to use their own measures of physical capacity. A steel company may use ingot tons, for example, while an aircraft engine maker compares the rated horsepower of the engines he produces.

• **In use of capital funds** there's a big industry shift, reflected by the dramatic gains in capacity scored last year—and plans for even greater expansion this year. In most fields, expansion programs are now coming ahead of modernization programs.

A year ago, manufacturing industries planned to invest 65% of their funds in replacing and modernizing existing equipment. Korea reduced that figure to 57%. And, in the year ahead, industry's budgets now indicate that only 42% of investment funds will go to replacement and modernization.

Even with the great increase in the share going for expansion, 1951 budgets for modernization and replacement will top 1950 — because overall investment will be so much

HOW MAJOR INDUSTRIES PLAN EXPENDITURES FOR 1951

(MILLIONS OF DOLLARS)

	1950 Expenditures	1951 Planned Expenditures	Percent Change
Chemicals	$1,350	$2,140	+59%
Autos	875	1,330	+52
Food	705	945	+34
Petroleum refining	700	995	+42
Machinery	635	940	+48
Steel	575	1,345	+134
Textiles	465	680	+46
Electrical machinery	180	315	+74
Transportation equipment	130	490	+277
Other manufacturing	2,450	4,165	+70
Total manufacturing	8,065	13,350	+66
Railroads	1,175	1,705	+45
Electric and gas utilities	3,200	3,490	+ 9
Other transportation and communications	1,700	1,900	+12
Mining	700	1,100	+57
All Industry Grand Total	14,840	21,544	+45

larger. This indicates that, if present plans are carried out, industry will make considerable headway in modernizing its facilities.

• **Industry's plans for financing** its huge expansion program reveal a sharp contrast to World War II. Then, with business emerging from ten years of depression and with wide-spread doubts as to whether war-built plants could be used in peace, the government directly financed a big share of facilities.

Today industry plans to finance virtually all of its capital program itself. The United States Steel Corporation, for example, has announced that it will not need outside financing for new facilities. It has authorized almost $700 million for added facilities—and the program is likely to be larger. Only one industry—aircraft—looks to the government for any major financing.

Industry counts on its own resources — retained profits and reserves for depreciation—to provide the bulk of the funds, 86% in the case of manufacturing industries. This is the same pattern of financing that has prevailed since World War II.

• **Accelerated amortization** aid from the government is counted on widely. Survey results on this are tentative, since many companies do not know how much of their programs will be granted approval. But manufacturing companies plan now to apply for certificates of necessity on something more than 40% of their programs.

The industries on which defense demands are greatest—such as steel, transportation equipment, chemicals and machinery—are asking for accelerated amortization on a much larger share of their programs. Both the steel and the transportation equipment industries for example, are requesting certificates on more than 80% of their 1951 programs.

Great as is the upswing in investment plans, businessmen expect defense needs will force still greater expenditures. The survey was taken in January, soon after the Chinese armies entered Korea and while the administration was presenting its defense budget for fiscal 1952. At that time, more than half of the business leaders surveyed expected that additional defense orders would force them to raise their plans for new plants and equipment later in the year.

How Manufacturing Industries Plan To Increase Their Capacity in 1951

	Percent Increase 1950-1951
Machinery	10%
Electrical manufacturing	14
Autos	17
Transportation Equipment	38
Steel	10
All manufacturing	9

How Other Industries Plan for 1951

	Capital expenditures percent change 1950 actual 1951 planned
Metalworking machinery	+ 96%
Agricultural machinery	+ 35
Construction & mining machinery	+ 66
Engines & Turbines	+ 77
General industrial machinery	+ 48
Nonferrous metals	+ 175
Service industry equipment	+ 15
Special industry equipment	+ 23

Manufacturers Plan to Spend 79% More on New Construction in 1951

	Construction expenditures percent increase
Machinery	82%
Electrical manufacturing	80
Autos	78
Transportation equipment	288
Steel	121
Total manufacturing	79

Manufacturing Industries Expand Capacity 75% Above 1939

	Index of Physical Capacity (1939 = 100)				
	Jan. 1946	Dec. 1948	Dec. 1949	Dec. 1950	Planned for 1951
Machinery	154	200	216	236	260
Electrical manufacturing	175	280	301	325	371
Autos	104	130	140	153	179
Transportation Equipment	243	250	265	288	397
Steel	112	115	121	126	139
All manufacturing	131	156	164	175	191

Where the Money Comes From

	PERCENT OF EXPENDITURES TO BE FINANCED FROM:				
	Depreciation & retained profits	Sale of stock	Bonds, bank loans or other debt	Govt. or govt.-guaranteed loans	Other
Machinery	85%	2%	7%	1%	5%
Electrical manufacturing	97	0	2	0	1
Autos	99	0	1	0	0
Transportation equipment	49	0	0	51	0
Steel	91	0	8	0	1
All manufacturing	86	1	9	2	2

NEWLY ELECTED national officers of ASTE, are, left to right, W. A. Thomas, supt. of tool engineering, Ford Motor Co. of Canada, elected secretary; H. C. McMillen, gen'l supt., Seeger Refrigerator Co., treasurer; Roger F. Waindle, gen'l mgr., Industrial Products Div., Elgin National Watch Co., 2nd v.p.; Harry E. Conrad, executive secretary; J. J. Demuth, gen'l supt., Sligo, Inc., president; Dr. H. B. Osborn, Jr., technical director, Tocco Div., Ohio Crankshaft Co., asst. sect.-treas.; L. B. Bellamy, manager, Detroit Branch, Sterling Grinding Wheel Co., first vice president; T. J. Donovan, Jr., owner, Donovan Co., third vice president

Need to Mobilize Know-How Stressed at ASTE Meeting

WILLIAM P. COOMEY, gen'l supt., Rice-Barton Corp., declared at ASTE meeting that "present machine tools are not equipped with adequate feed and speed ranges to make possible the maximum metal removal rates"

NEW YORK—Meeting here March 14-17 for its 19th annual convention, the American Society of Tool Engineers presented one of the most comprehensive technical programs in its history.

Setting the convention theme of "Mobilizing Production Know How" was a joint armed services-industry open forum conference (see photo below) attended by several hundred members from the U. S. and Canada.

Technical sessions covered a broad range of subjects, including such items as gears, hobs, cutting tools, abrasive belt grinding, milling methods, tapping, metallizing, surface finishing, grinding, welding, gaging, machinability, press working, quality control, inspection, lubricants, plant layout, machine replacement, carbide machining, automatic controls.

At the annual banquet, R. F. V. Stanton, executive vice president and general manager of American Machines & Foundry Co., New York, pointed out that tool designers commonly work to an accuracy of four-tenths of one percent, and suggested that they survey the general situation and insist that government, too, work to similar limits.

The 1952 meeting and tool show will be held in Chicago.

SENATOR Ralph Flanders of Vermont receives card of honorary membership in ASTE in recognition of his services to tool engineering and of his "outstanding statesmanship"

MILITARY-INDUSTRY panel speakers were (standing), Herbert L. Tigges, outgoing ASTE president and vice president of Baker Bros., Toledo; panel moderator Roger F. Waindle, gen'l mgr., Elgin National Watch Co.; and (seated) Capt. C. L. Helber, supervising inspector of Naval Materiel for New York; Lt. Gen. K. B. Wolfe, deputy chief of staff, Air Force; Col. John S. Walker, district chief, New York Ordnance District

Names in the News

Fred J. Kampmeier

Gunnard R. Olson

Fred J. Kampmeier and **Gunnard R. Olson** have been elected vice presidents of Ingersoll Milling Machine Co., Rockford, Ill. Mr. Kampmeier, who continues in charge of production engineering, joined Ingersoll in 1922, and was named in charge of the engineering department in 1936. Mr. Olson joined Ingersoll in 1919, later served five years in charge of sales engineering, and became Detroit sales representative in 1939. In 1943 he was named manager of machine sales.

John B. Dempsey has been named manager of the Detroit branch, Independent Pneumatic Tool Co., Aurora, Ill., succeeding **Robert G. Faverty,** recently named managing director of Armstrong-Whitworth & Co., Pneumatic Tools, Ltd., new Thor subsidiary in England. **Edward W. Krantz,** New York branch manager, succeeds Mr. Dempsey as Pittsburgh manager, and **William J. McGraw,** Cleveland manager, succeeds Mr. Krantz at New York. **Clarence B. Mergren** was named Cleveland branch manager.

L. P. Jackson has been elected president of Mid-West Abrasive Co., succeeding **James T. Jackson** who died recently. **A. C. Reppenhagen,** secretary, has been named executive vice president and treasurer.

Donald H. Workman has been named executive vice president, Gray Iron Founder's Society, with headquarters in Cleveland.

Ermand L. Watelet has been named director of design of precision tools and gages, Brown & Sharpe Mfg. Co., Providence, R. I. Mr. Watelet joined Brown & Sharpe in 1934, working on development of electrical equipment for machinery and small tools. In 1947 he was made chief designer of small tools and gages.

T. L. Swansen has been named vice president in charge of manufacturing and **E. O. Dixon** was named vice president in charge of research and metallurgy of Ladish Co., Cudahy, Wis.

Harold E. Webb, Glendale, Calif., has been named West Coast sales and service representative of Greer Hydraulics, Inc., Brooklyn.

Herbert B. Nechemias has been named manager of the Industrial Sales Dept., Wagner Electric Corp., St. Louis, succeeding **J. S. Smith** who was named director of purchasing.

James G. Sisson, experimental engineer in the Dial Gage Div. of L. S. Starrett Co., Athol, Mass., has retired after 56 years of service. He joined the firm in 1895 and from 1912 to 1932 supervised operations on precision vernier types of tools.

Donald M. Laflin has been named general sales manager, Giddings & Lewis Machine Tool Co., Fond du Lac, Wis. He joined Giddings & Lewis in 1934 as eastern district sales manager, after serving earlier with Cadillac Motor Car Co., Detroit; Cincinnati Milling Machine Co., and Washington Navy Yard. During World War II he was assistant chief, Tools Div., War Production Board.

R. A. J. Wellington, general sales manager since 1949 of Precision Metalsmiths, Inc., Cleveland, has been named vice president in charge of sales. He was prominent in machine tool circles for 20 years when he joined Precision in 1945 as Cleveland sales representative.

Alfred P. Barton has been named chief engineer, Ordnance Div., Elgin National Watch Co., Lincoln, Neb.

Gordon F. Colson has been named field engineer, Abrasive Div., Norton Co., Worcester, Mass. He will be located in the Chicago area. Until his appointment, he was a grinding engineer in the Sales Engineering Dept. at Worcester.

Richard Moyer has been named general manager, North Central Div., Link-Belt Co., Minneapolis, succeeding **Leslie J. Carson,** who was appointed price executive, Machinery Branch, Industrial Materials & Manufactured Goods Div., Office of Price Stabilization. Mr. Moyer, who was general superintendent at the Pershing Road plant in Chicago, is succeeded there by **Fred B. Skeates,** personnel manager. Mr. Moyer joined Link-Belt in 1937, and held various important positions at Link-Belt Ordnance Co. during the war.

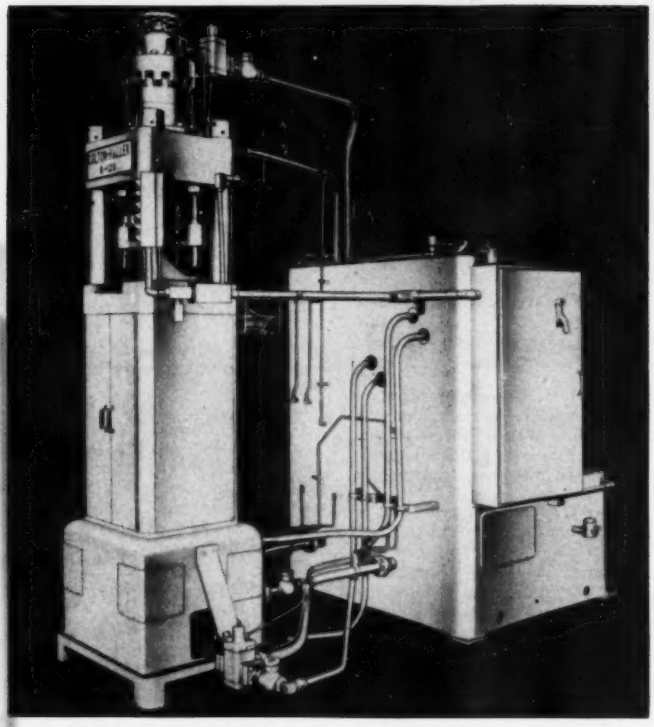
Ermand L. Watelet

Donald M. Laflin

James G. Sisson

Richard Moyer

New Shop Equipment



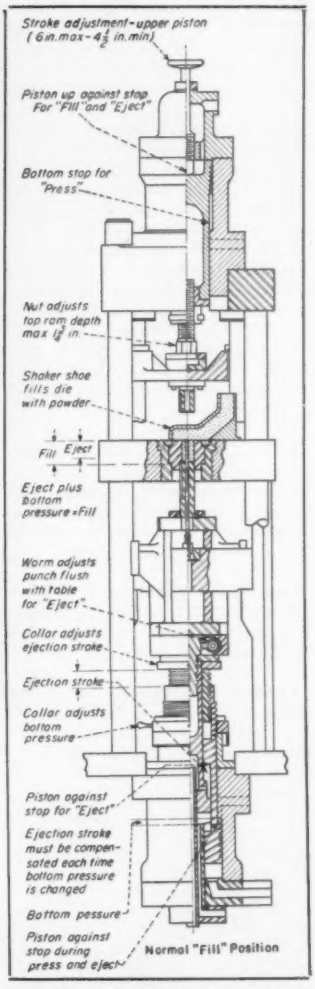
Press (No. 6-125) and hydraulic pump unit have working parts enclosed to minimize damage from abrasive powder. Operator works from a platform, built by purchaser, around machine. All controls are on a pushbutton station convenient to the operator's reach. Safety switches prevent out-of-sequence motions which might damage tools.

Hydraulic Metal-Powder Press Repeats to Tolerance of 0.002 in.

Die fill	6 in. max. to 0 in.
Tie rods	4, one at each corner
Pressures (psi)	final press, 3000; rapid approach, 600
Cycles per min.	6-in. fill, 12; 3-in., 18
Power	3 10-hp Racine pumps using 5:1 intensifiers

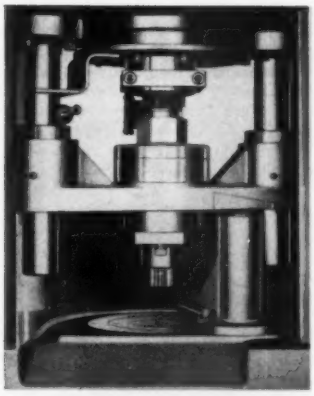
Complicated metal-powder parts require close control of the press cycle. Pressure and motion must be exactly where needed. By minimizing the faults of mechanical linkage and hydraulic actuation, and by combining the good qualities of both, this design is claimed to meet these requirements. Two models are available, No. 6-125, and No. 6-100, with capacities of 125 and 100 tons respectively. They were built by Colton in collaboration with John Haller of Michigan Powdered Metal Products.

Both presses have dual concentric lower cylinders, the outer for compacting and the inner for ejection. Stroke of both top and bottom cylinders can be individually adjusted and locked externally. Compression ratio, therefore, remains constant. The lower compression stroke can


Stroke adjustment-upper piston (6 in. max-4½ in. min)
Piston up against stop For "Fill" and "Eject"
Bottom stop for "Press"
Nut adjusts top ram depth max ½ in.
Shaker shoe fills die with powder
Fill
Eject
Eject plus bottom pressure = Fill
Worm adjusts punch flush with table for "Eject"
Collar adjusts ejection stroke
Ejection stroke
Collar adjusts bottom pressure
Piston against stop for "Eject"
Ejection stroke must be compensated each time bottom pressure is changed
Bottom pessure
Piston against stop during press and eject
Normal "Fill" Position

Operation and adjustment are simple. When the start button is pressed, a relay is energized and the upper ram moves down. As it does, it closes a second relay which causes the lower ram to move up. They then dwell at the work for a period determined by a timer relay. When the upper ram starts up it energizes a second timer which, in turn, sets off the relay which actuates the ejection ram. As this withdraws, another relay causes the loading shoe to move over the die opening. After delay, shoe clears die.

Materials and Parts



Full control and easy access are characteristics of the Colton-Haller press. The table has a die opening of 8¾ in. through the table with an opening of 10⅝ in. for the flange. An important feature is the ease and rapidity of die change. The feed cup has adjustable hydraulic agitation over the die cavity

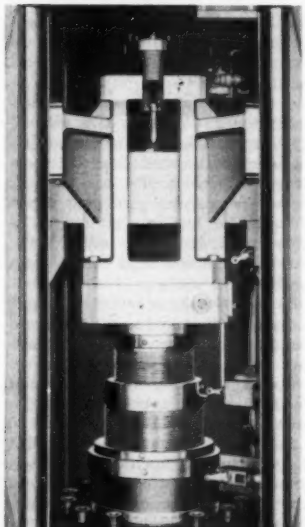
be locked out of operation, thus permitting compressing from the top side only, but with ejection cylinder functioning in the usual manner.

By adjusting the position of the limit-switch cams which control the stroking of the lower cylinders, operation speed can be increased when less than maximum fill is used.

Feed mechanisms include a reciprocating feed cup with automatic adjustable hydraulic agitator for powdered metals, and a shuttle feed for other materials. "Quick-Change" punches and dies are used, which, it is claimed, reduce downtime 50 to 75%. Press dimensions are: 42 in. wide x 42 in. deep x 12 ft 8½ in. high. Die table height from floor is 6 ft 11½ in.

Compact-thickness tolerance is 0.001-0.002 in. and changeover time from one part to another averages 45 to 90 min. In operation, these presses act with a "snap" that suggests mechanical rather then hydraulic motivation.

Arthur Colton Co., Div. Snyder Tool and Engineering Co., Detroit 7, Mich.



Lower compression cylinder, ejection cylinder, and core rod are shown here. Mechanical adjustments of top stroke, bottom stroke, and ejection can be made. A combination of mechanical stops and limit switches provides positive action and simple set up

Black-Granite Surface Plate

This surface plate is said to have an accuracy up to 50 millionths of an in. The surface is claimed to be harder than tool steel and to be non-deflecting, non-glaring, and to require no oiling. Known as the Micro-Flat, it is available in sizes from 9x12 to 54x108 in. Its uses are for bench work in tool and die making, inspection, instrument assembly, and any work where a smooth surface is necessary.

Collins Granite Surface Plate Co., 1331 Santa Fe Ave., Los Angeles 21, Calif.

...INCLUDING

Vertical millers have electronic controls for all feeds through a centralized station ..... page 142

Boring and facing machine eliminates boring-bar overhang by using a cross-slide ..... page 142

Hydraulic press has a pipeless main circuit ..... page 143

Dogs for lathes and grinders use a concealed spring to hold a cam to the work ..... page 144

Center eliminates lathe dogs by employing a spring-loaded front plate ..... page 146

Optical follower enables miller to act as a jig borer, is accurate to 2 tenths ..... page 150

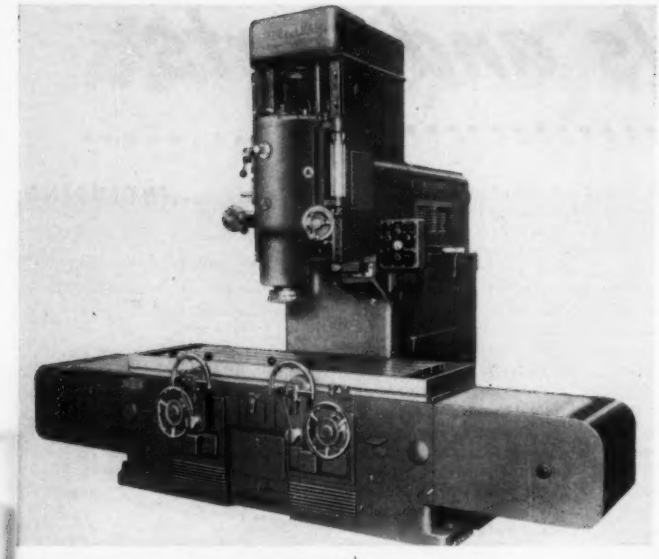
Automatic screw machine employs a stopping device to reduce spindle speed ..... page 158

Mobile worktower has platform which rises 10 ft in 25 sec by use of hydraulic ram ..... page 154

Vertical-mill attachment has shield over power-transmission parts to protect operator page 150

...and in April 16

Show-in-Print section presenting the latest in equipment as it will be revealed at the 4th National Materials Handling Show in Chicago, April 30 to May 4.



Electronic Controls for Feeds Feature Vertical Millers

Designed for heavy-duty milling and die-sinking operations, the improved No. 4 Reed-Prentice miller features electronic control for all feeds. A master control station is employed containing spindle start, stop and jog pushbuttons; dials for regulating speeds of table, cross and vertical slides; selector switch for the two slides; and an emergency master-stop pushbutton.

Centralized levers are within easy reach of the operator at the front of the table. Table and cross slides have identical control systems with each consisting of a half handwheel and a ball-grip lever. The lever selects feed or rapid traverse in either direction through five positions. The handwheel gives an infinitely variable feed rate in either direction.

Two 3-hp ac motors, one for the table and one for the cross slide, power rapid-traverse motion. The feed rate is constant, preselected and controlled by the position of potentiometers located on the pushbutton station.

The spindle is driven by a 10-hp, 1200-rpm motor and is reversible. Electrical interlocks and positive mechanical means safeguard against faulty operations.

Three 1½-hp variable-voltage dc motors power the table, cross slide, and vertical slide. Range of infinitely-variable feeds is from ½ to 25 ipm. The controlling electronic units provide full-wave rectification, armature control, reversing, overload and undervoltage protection, armature-voltage-drop compensation, and dynamic brake from any speed to prevent coasting.

The miller has a square-gibbed construction for the three sliding units with pressure-lubricated ways, visible-supply pump-lubricating system for spindle head and drive gearbox, and micrometer-type dials that indicate the travel of table, cross slide, and spindle head.

Dept. A, Reed-Prentice Corp., 677 Cambridge Ave., Worcester 4, Mass.

Instant Start and Stop Feature Welding Positioner

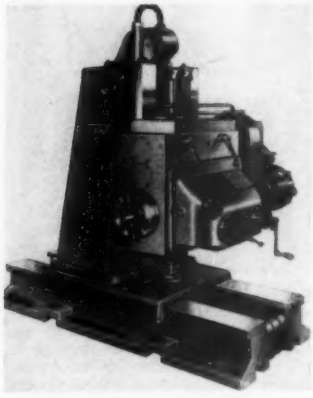
A solenoid-actuated clutch in this positioner for automatic welding allows instant start and stop of the worktable. In this way, the welding machine and positioner can start at the same time.

The table rotates at any infinitely variable speed from 0 to 5 rpm on Timken roller bearings. Backlash is said to be negligible. The table can be tilted at any angle up to 360° and locked. Work arm is adjustable to any length up to 16 in.

The model illustrated has an air cylinder attached to the table spindle. This actuates a pullbar through the spindle that clamps the work to the table.

Known as the model 14BT500, it can be used for automatic, semi-automatic, and heliarc welding, brazing, etc. Capacity is 500 lb.

Aronson Machine Co., Arcade, N. Y.



Forney Boring, Facing, Machine Eliminates Boring-Bar Overhang

Greater rigidity for the cutting tool features this floor-type horizontal boring machine. Instead of extending the boring bar from the machine and thus inducing possible deflections due to bending stresses the entire spindle housing is moved into the work on a cross slide. This construction reduces vibration and increases permissible feed and depth of cut. The bar is mounted on a quill that is journaled in the head; the spindle nose a fixed 4.25 in. from the bearing.

As a stationary machine, the unit is usually mounted on a concrete foundation. A large sectional cast-iron floor plate is permanently mounted adjoining the foundation to serve as an anchorage for the workpieces.

As a portable machine, the unit is mounted and anchored to a sectional square-slotted floor plate which also accommodates the workpiece. A large U-bolt is provided at the upper end of the column for crane-lifting the machine to the work.

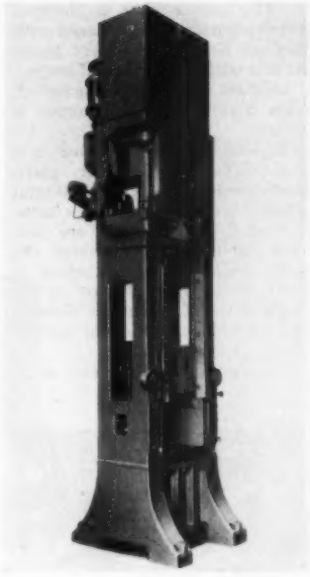
If the machine is to be used for large boring or facing operations, backfacing of flanges, etc., a special face plate with tool-block slide may

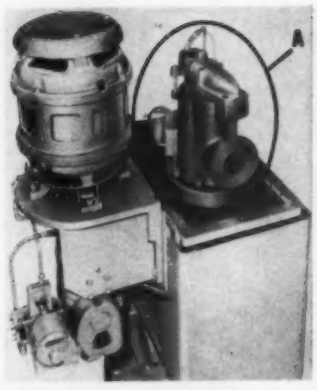
be mounted on the head of the spindle. The slide allows the tool block to be moved uninterruptedly from maximum outer position to center. The face plate has a diameter of 33 in. A small clutch lever enables selection of either crank or automatic means of moving the tool block.

The main drive shaft carries a twin-disk clutch and friction brake which permits instant starting, stopping, and inching of the spindle. A safety friction clutch protects the vertical and longitudinal feed mechanisms against damage should the column or cross rail be moved beyond working extremities, or against an obstruction.

An optional feature is a rapid traverse driven by a vertical fractional-hp motor which permits rapid positioning both horizontally and vertically.

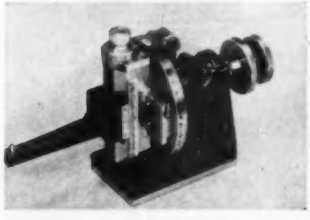
Forney's Inc., New Castle, Pa.





Upper section of press with reservoir removed, showing motor, with pump and pilot unit below it. "A" indicates the valve unit

Cutaway section of front view of press shows area around cylinder barrel. Note absence of piping



Perfex Form Dresser With Built-In Micrometer

The Tangi-Matic is for dressing of all angle-tangent-to-radius grinding-wheel forms. It is said to reduce the usual setup time 75%, as it eliminates height gages, micrometers, etc.

To set the dresser, the diamond is locked securely to the top height of the master setting gage, with built-in vernier and micrometer both turned to zero. Settings to radii are made from this position, each revolution of the leadscrew moving the diamond 0.050 in. Two stop dogs control desired arc. Concave radii as small as 0.032 in., full 180°, can be dressed using a special attachment.

Dressing takes place from the bottom of the wheel. This permits the operator to accurately control the wheel by using the grinder drawfeed.

All wearing parts are steel, hardened, ground, and lapped. The micrometer leadscrew is hardened and precision ground.

Perfex Tool & Gage Co., Dept. A, 123 Avery St., Mt. Clemens, Mich.

Elmes Hydraulic Press Has Pipeless Main Circuit

The only pipes in this metalworking hydraulic press are the pilot, suction, and drain lines, and of these, only the pilot line carries high pressure. All fluid in the main circuit is conducted through short, direct passages drilled in the structural parts. Advantages claimed—no high-pressure screwed joints to loosen, no welded joints breaking loose, and smooth operation, reducing vibration.

As a result, maintenance is reduced in time and cost. The pumping unit can be removed as a unit without disconnecting piping. The valve assembly, located in the oil reservoir, is also removable as a unit.

Reversing pumps are used in the new circuit. The shifting and centering system is a miniature pipeless circuit in itself. Since this unit is mounted directly to the hydraulic pump, only electrical or mechanical connections need be made.

The pipeless valve unit contains all necessary provisions for prefilling during rapid advance, changing to pressing speed by either pressure or position, and decompression prior to reversal. They are designed in a wide range of sizes for application to many different speeds and tonnages.

Standard features include push-button control, pressure and stroke reversal, and no hesitation of platen on position slowdown. The pipeless main circuit can be supplied to any of the company's presses, standard or special.

American Steel Foundries, Elmes Engineering Div., Cincinnati 29, Ohio.

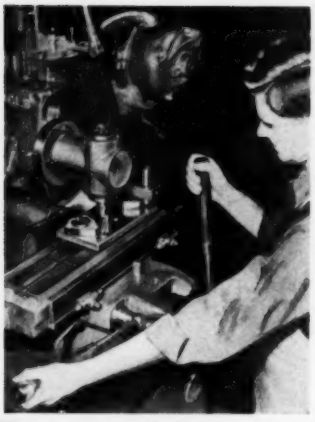
Bright Finish for Zinc Plate

Compound made by Allied Research gives a bright Iridite treatment to zinc plate. It produces a protective chromate film on the surface of the treated parts. The most important advantage claimed for this compound is the fact that the film can be produced on zinc plate of less than 0.0001-in. thickness. Cost of application per square ft ranges from 3/100 of a cent for strip-mill plating to 1/10 on piece parts in automatic-plating machines.

The coating itself is bluish bright or yellow iridescent, depending upon operating conditions used. Corrosion resistance varies upwards with the intensity of the iridescence.

The Iridite can be applied with an immersion time of from 20 sec to more than a full min. It is shipped to users as a combination of a liquid and a powder.

Allied Research Products, Inc., 4004 E. Monument St., Baltimore, Md.



Vertical-Milling Attachment Has Speeds Up to 2000 rpm

This attachment is for converting standard Nichols horizontal millers. It is designed to take a 1-hp drive, with max. speeds up to 2000 rpm.

A heavy one-piece casting houses the entire mechanism. Machined alignment pads on the body casting simplify mounting. The hardened and ground drive shaft is mounted in double-row ball bearings, and the vertical spindle in Zero Timken bearings at both ends. Spiral bevel gears are heat-treated and carefully fitted.

The vertical spindle is held within 0.00015-in. max. allowable runout. The spindle nose is identical with the horizontal one, bored with a No. 40 National Standard taper, and thus will interchange all tooling. A standard drawbolt is furnished, and a draw-in collet attachment is available.

The attachment is mounted in a circular T-slotted adapter plate, which encompasses the horizontal spindle nose, and is held by 4 bolts. Graduations in degreees are provided for swiveling around the horiz. spindle. The attachment is driven by a splined adapter in the mouth of the horiz. spindle. Spindle speeds are 1/3 higher for the vertical spindle (4:3 ratio.)

W. H.. Nichols Co., Waltham, Mass.

Dog Bites Work Saves Time, Labor

Grinder and lathe dogs made by Ready Tool are claimed to increase production, particularly on semi-automatics and where there is little traverse feed. A concealed spring holds a cam to the work.

For grinders, the cam face is accurately ground smooth, both surface and contour, thus protecting the surface against mars. For lathes, the face is serrated to prevent slipping. Construction is steel, with hardened face and set screws. Brass cam and screws are available for grinders.

The work is placed in the dog, holding the cam against the spring with a finger, and the two screws are set. To remove the piece, the cam is released. While one dog is being used, a second dog can be put on the next piece. Capacities available range from 1/8 up to 6-in. dia.

Ready Tool Co., 550 Iranistan Ave., Bridgeport, Conn.

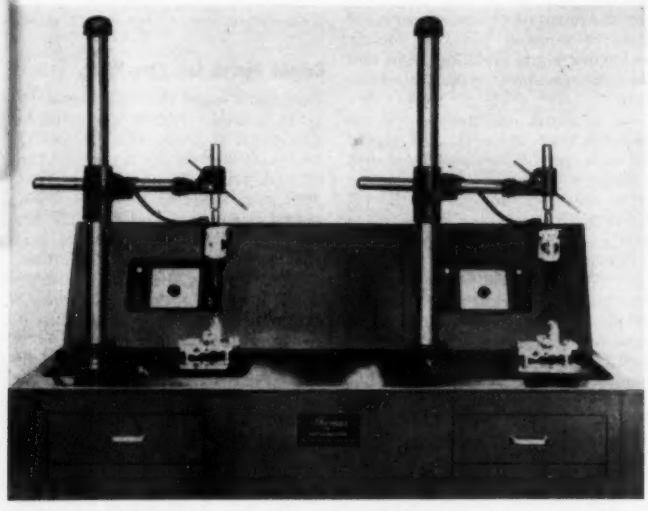
Norgren Lubricator Breaks Down Oil Into 2-Micron Dia Particles

The Micro-Fog lubricator is claimed require less air, to carry the oil particles over greater distances, permit more precise control of oil flow, and to not require special lubricants.

Operation is automatic and the oil feed and supply are visible. The fog can be distributed over several outlets. Particles larger than 2 microns (0.00007874 in.) in dia return to the oil supply. Approximately 5% of the oil in the feed tube is converted into fog at any one time. As a result, the oil can be metered to as little as one drop per 20 min, if required. Because the fine particles remain in suspension indefinitely, it is said that multiple units in simultaneous operation can be lubricated uniformly.

The lubricators cover a range 1 cfm at 10 psi up to 14 cfm at 80 psi. Max. safe operating pressure is 125 psi. Eight models are available, ¼- and ⅜-in. pipe size, in bowl capacities of 1/3 and 1/2 pint.

C. A. Norgren Co., 222 Santa Fe Drive, Denver 9, Colo.



METAL DISINTEGRATOR was made to the specifications of one of the large auto makers. Motor blocks containing broken taps are moved on roller lines to each end of the unit. Here the taps are removed, the twin machines being handled by one operator.—*Warner Div., Clinton Machine Co., Detroit, Mich.*

The Taft-Peirce 6" Rotary Grinder with .0001" vernier for *super-precise* rotary grinding.

The Taft-Peirce No. 1 Precision Surface Grinder with .0001" vertical and cross feed verniers for the *highest degree of accuracy, flatness, and finish* on plane surfaces.

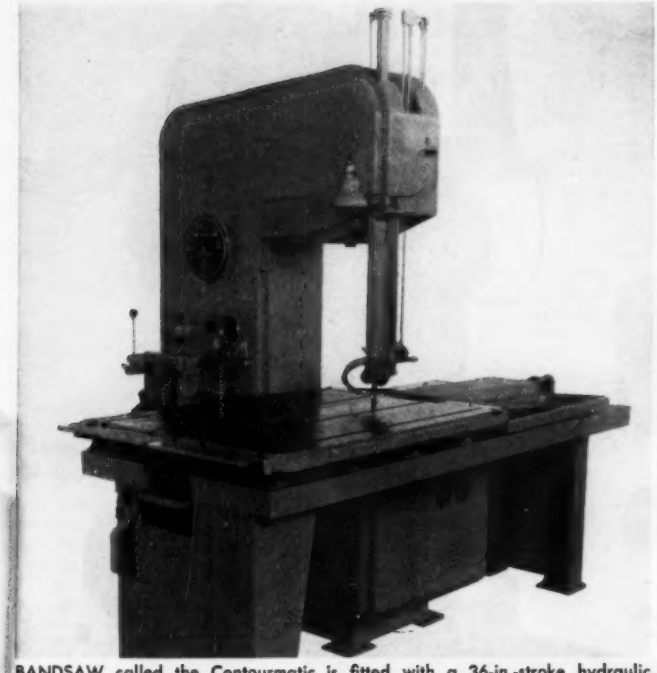
When you want the *Ultimate in Accuracy* try this trio

The Taft-Peirce 24" Lapping Machine for *that last critical element of precision super-finish* on plane or cylindrical surfaces.

The accumulated skill of the world's most experienced tool and gage makers has gone into these three machines . . . all originally developed *for our own gage production.* Each has been designed and built with the ultimate care to give the ultimate in accuracy, flatness, and finish. If accuracy is *your* problem . . . let us tell you about the unusual features of these machines.

THE TAFT-PEIRCE MANUFACTURING COMPANY
WOONSOCKET, RHODE ISLAND

T-P *means* Top Precision



BANDSAW called the Contourmatic is fitted with a 36-in.-stroke hydraulic worktable for machining jet-engine components. The work height was increased as required. Operations are governed by control knobs in a central panel on the column. Feed rate is variable to 18 fpm with rapid return. Cutting speeds are infinitely variable from 40 to 10,000 fpm. Work-weight capacity is up to 1 ton.—*Doall Co., Des Plaines, Ill.*

TRANSFER MACHINE with 5 stations drills the main-bearing cap holes and drills, reams, and chamfers the master dowel holes in cast-iron, valve-in-head cylinder blocks. Hydraulically operated, counterweighted brackets turn the part 90° at the loading and unloading station so that it enters and leaves the machine on the bottom face but goes through on its side.—*Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7, Mich.*

Simplified Mechanism Used in Pneumatic Impact Wrench

Used for both driving and removing nuts, studs, and screws, the Model M950 is rated for ⅜-in. bolt-size on most work. However, because of an improved air-inlet control valve, the one model may be used for many different sizes.

There are only two parts used in impacting, and the unit does not contain any springs or gears. Impacting only takes place when the nut begins to tighten. The handle and motor housing unit is a one-piece magnesium casting.

Master Pneumatic Tool Co., Inc., Orwell, Ohio

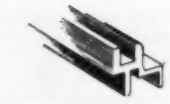
Eliminate Lathe Dogs When Turning Between Centers

The Shaftmaster center made by Wiest holds work by axial pressure between tailstock and spindle. The front plate and centerpoint are spring loaded—the knurled front plate thus digging into the work when pressure is applied.

By eliminating the lathe dog, the entire length of the workpiece can be turned without having to reverse it. The operators safety is also increased because of the elimination of the projecting dog. Another advantage claimed is that it is possible to change the work without stopping the spindle.

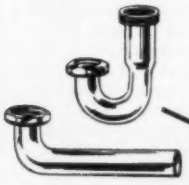
Morse-taper shafts available are 2, 3, 4, and 5 for work diameters in steel between 0.393 and 2.75 in. The knurled plate is replaceable.

Karl A. Neise, 381 Fourth Ave., New York 16, N. Y.



EXTRUSIONS AND ROLLED SHAPES

REFRIGERATION AND HEATING

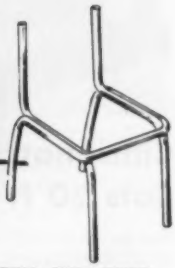


PLUMBING FIXTURES

NEED A FASTER METHOD of BENDING PARTS LIKE THESE

PHONE PINES . . . BUILDER OF AMERICA'S FINEST PRODUCTION BENDING MACHINES

AIRCRAFT PARTS



METAL FURNITURE

6 COST CUTTING FEATURES OF PINES BENDERS

- Produce Accurate Uniform Bends without marking or distorting.
- Push-Button Control — simple, easy for one man to operate.
- Highly Versatile — handle a wide variety of work — serpentine, coil, compound, and multiple bends.
- Fast Set-Ups — tool changes in 10 minutes.
- Narrow in Width — fits into small areas.
- Superior Design — tapered alloy-steel spindle, adjustable gibs, Timken bearings, panel-mounted valves, Vickers pump.

THE Pines principle of bending piping, tubing, extruded or rolled sections and mouldings employes tested and proven methods that assure best results and peak production. Roll, compression, draw, and stretch methods are skillfully adapted to best suit your material specifications and product requirements. Hydraulic power, push-button controls, and automatic operation are combined assuring high efficiency and production economy. A complete range of Benders are provided for light or extra heavy work, for small lot or high production runs. Ask Pines to analyze your bending problems now. Phone Aurora 2-7608.

***Write Today* FOR FREE LITERATURE**

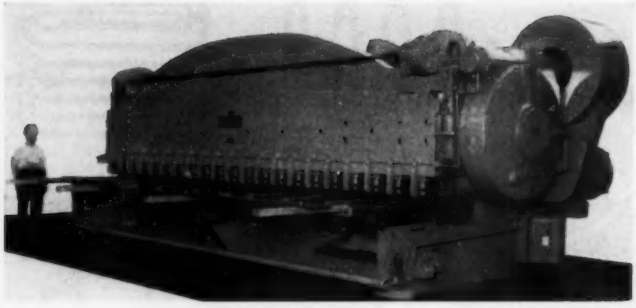
Find out how Pines Benders are designed to save time and cut costs on a wide range of work. Literature described and pictures various models, attachments, and methods on actual jobs.

BENDING PROFILING CUT-OFF CENTERING MACHINES

PINES ENGINEERING CO., Inc.

Specialists in Tube Fabricating Equipment

672 WALNUT AURORA, ILLINOIS



Cincinnati Squaring Shear Cuts 20 ft x ½ in. Steel Plate

This unit is claimed to be the longest ½-in. shear ever built. It weighs over 135,000 lb and has a speed of 20 strokes per min. Hydraulic hold-downs are capable of exerting a force of over 70 tons. The hold-down pistons have automobile-type rings that are claimed to give it long life. A vacuum-pump arrangement prevents leakage of hydraulic oil.

The shear has a 24-in. throat and a 48-in. back-gage range. Standard equipment includes 4-edge tool-steel knives with straight sides and a cross-section measuring 1¾ x 6½ in., ball bearing back gage with graduated dials, automatic lubrication, hinged angle, and complete guarding.

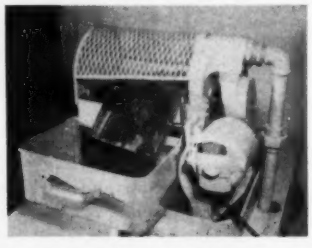
The Cincinnati Shaper Co., Hopple, Garrard, & Elam Sts., Cincinnati 25.

S & E Carbide Rotary Cutters

Ten shapes are offered in this line of cutters, each in head diameters of ⅛, ¼, ⅜, and ½ in. The ⅛- and ¼-in.-dia tools are solid tungsten carbide. Heads of the other two are of solid carbide, butt brazed to the shanks by a process that is claimed to give great strength.

The heads are form ground concentric with the shanks, permitting high speeds and feeds. The shapes are cylindrical, cone, oval, inverted cone, ball, cylindrical ball end, tree shape, pointed oval, 60° cutter, and 90° center. They are available individually and in sets.

S & E Machine Products, Inc., Bridgeport, Mich.



Houdaille Magnetic Clarifier Uses Permanent Ring Magnets

This clarifier is claimed to remove over 98% of contaminants from liquid coolants. It can be used on grinders, milling machines, gear shapers, etc.

Removal of particles is accomplished by permanent ring magnets enclosed in a revolving non-magnetic cylinder. The ends of the cylinder are circular steel disks which act both as magnet poles and as seals to keep the coolant from contacting the magnet core. This design provides 360° of constant attraction.

Turbulent flow of coolant beneath the cylinder keeps metallic particles in suspension until attracted to the poles. This is accomplished by the flow pan beneath the cylinder which has a restriction at its center. Abrasive non-magnetic particles are entrained with the magnetized contaminant. They are both collected by a non-magnetic trough which is fitted to the magnetic cylinder. No wear occurs because the trough does not rub on the cylinder—the accumulation of particles wipes the cylinder as it revolves past. The small percentage of contaminant not removed is said to be so minute in size as to be unimportant.

The unit is rated at 20 gpm. If the flow rate is increased beyond this rated capacity the excess coolant automatically overflows into the base before reaching the magnetic field. Thus, spillage is prevented, since the overage is returned to the machine sump.

The clarifier measures 22⅝ in. long by 16½ in. high by 15 3/16 wide. It operates on a 1/12-hp 60-cycle 110-volt single-phase motor. Cycling pump on machine tool or a separate pump and motor can be used to provide flow. When possible to use gravity flow, a special interchangeable inlet casting is supplied. Cylinder is driven by fully enclosed worm and worm gear packed in grease.

Honan-Crane Corp., 701 Indianapolis Ave., Lebanon, Pa.

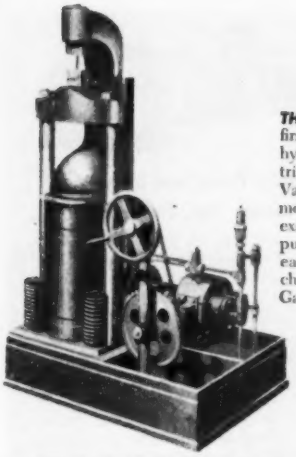
Hammond Carbide-Tool Grinder For Chipbreakers and Diamonds

Addition to the Kalamazoo line is a Model CB-77-W, wet, combination chipbreaker and diamond-finishing grinder.

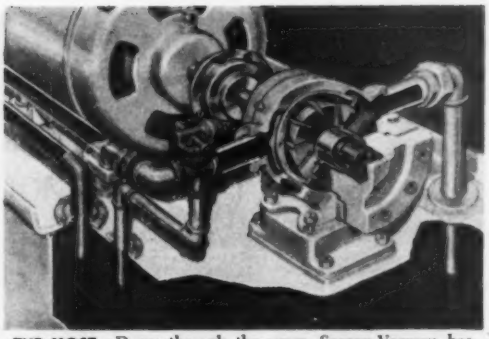
The cup-wheel side is for diamond finishing. The other side is for chipbreakers and the VC solid-carbide-insert grinding fixture.

Coolant is provided by a self-contained pump and tank unit, with the spouts built to swivel in any direction.

Hammond Machinery Builders, Inc., 1618 Douglas Ave., Kalamazoo, Mich.



THE PIONEER—When oil first displaced water as the hydraulic medium in industrial machinery . . . Socony-Vacuum pioneered development of these products. For example, this first Hele-Shaw pump, which operated an early Baldwin testing machine, was charged with a Gargoyle hydraulic oil.



THE MOST—Down through the years, Socony-Vacuum has been a leader in every major development in hydraulic oils. Result? . . . Today, more hydraulic systems in industrial machinery are filled with Socony-Vacuum products than with the products of any other oil company!

FIRST IN HYDRAULICS
IN EVERY WAY!

Why Accept Anything Less?

There's a reason for leadership in every field – and in the field of hydraulic oils, Socony-Vacuum products are recommended and approved by more builders of hydraulic mechanisms than the products of any other oil company! Here's why . . .

Famous Gargoyle D.T.E. Oils are top quality – embody all the properties necessary for trouble-free performance of hydraulic mechanisms of every size and type. They assure more continuous operation, increase production, extend periods between drains, materially reduce maintenance costs.

Why accept anything less for *your* machines?

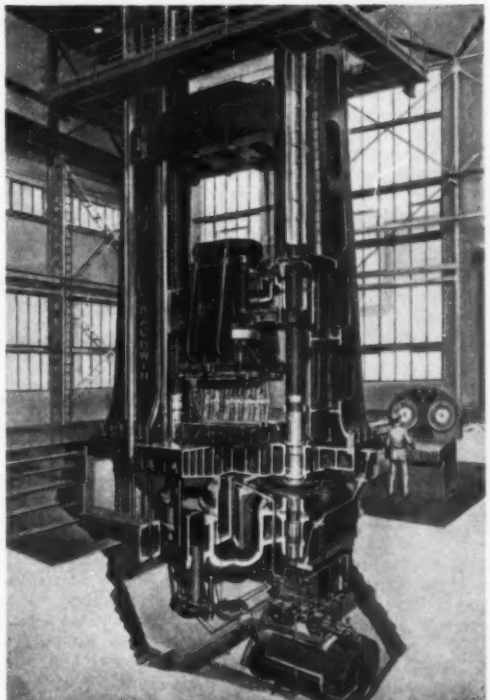
SOCONY-VACUUM

GARGOYLE Lubricants

SOCONY-VACUUM

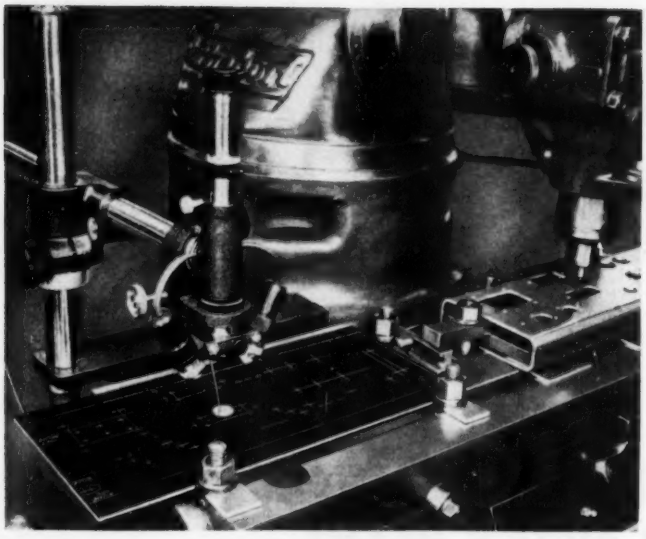
Correct Lubrication

WORLD'S GREATEST LUBRICATION KNOWLEDGE AND ENGINEERING SERVICE



THE BIGGEST—This world's biggest testing machine can apply a force of 5,000,000 lbs.–yet is sensitive enough to measure loads to 1,000,000th of its capacity! For the critical job of protecting this super hydraulic machine, the builder chose a Gargoyle hydraulic oil!

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION



Boeckeler Optical Follower Transforms Miller Into Jig Borer

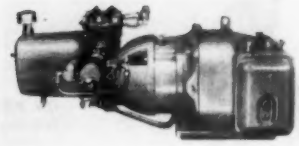
This optical follower replaces the tracing finger used on conventional duplicating machines. An adjustable 32X microscope is employed to visually follow the pattern plate. It is claimed to be accurate to 2 tenths and can be attached to any knee-type milling machine.

The templet is made with a height gage or other conventional layout methods, the pattern being scribed on steel, aluminized glass or other suitable material.

Advantages claimed include: Human error while machining is reduced since the operator has to merely follow a crosshair. Accumulated mathematical error in setting up the work is eliminated. Shaping and squaring the sides of the die block are not necessary, though the bottom must be machined to flatness.

Price for the unit is $335., F.O.B. Tucson.

Boeckeler Instrument Co., 29 E. Rillito St., Tucson, Ariz.



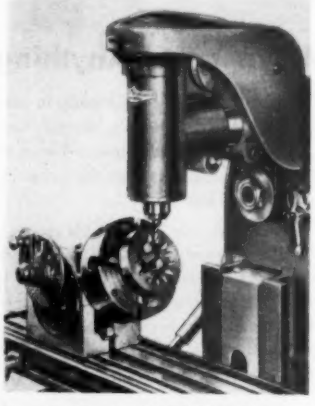
Hydraulic Pump and Motor For Presses, Jigs, Fixtures

Solid coupling of motor and pump eliminates drive belts, lessens repair costs. Combining the two in one unit is also claimed to minimize pressure flutter and overheating.

The line includes over 100 models with a total range of 1.8 to 8.25 gpm, and pressures up to 1000 psi.

The complete unit includes the motor, coupling, vane pump, reservoir, oil cooler, air filter, overload valve, pressure-regulating valve, and 3- or 4-way valve or a combination of both.

Harco Industries, 20 Curtice St., Rochester 5, N. Y.



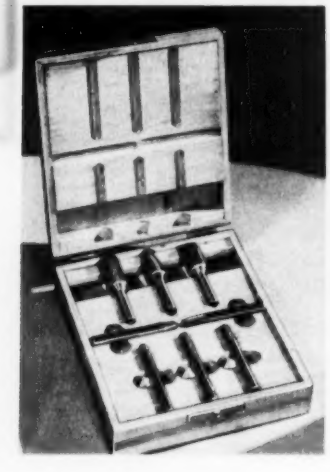
Marvin Vertical-Mill Attachment Doubles Range of Bench Millers

Overarm dia	1½ in.
End-mill shank capacity	⅜ in.
Spindle speeds	same as machine
V-belt pulley bore	1 in.

A few of the many jobs that this head can handle are small dies, molds, sprockets, clutches, cams, and a variety of contour milling.

The attachment is equipped with a Timken tapered roller bearing spindle driven by pulleys and V-belt from the machine spindle. A shield over the power-transmission parts protects the operator. The spindle may be set out beyond the table or at angles right or left of vertical.

Marvin Machine Products Inc., Detroit, Mich.



Set of Carbide Finishing Tools Designed for Tool & Die Maker

The various cuts, tooth patterns, and shapes in this set of eight ¼-in.-shank burrs are claimed to cover a great range of usefulness, and to work equally well on soft or hardened dies.

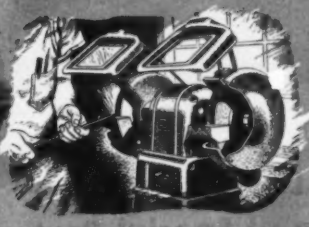
Made of solid carbide, they may be reground repeatedly. It is claimed that the tooth patterns are of a type which makes possible rapid stock removal and minimizes annoyance from slivers. They are furnished in a sturdy wooden case which may be used as a permanent chest. The tools can be picked out of the box with one hand, without pulling. The flat design aids in storing.

Severance Tool Industries, Inc., Saginaw, Mich.

Have you a FINISHING problem that Black & Decker can solve?

B&D SANDERS drive a variety of attachments to speed up sanding metal and wood, grinding down welds and casting ridges, removing rust, paint and scale, shaping and semi-finishing lumber, and many other finishing jobs. Four models: 7" and 9" disc diams.

B&D PORTABLE GRINDERS let you bring the tool to the work when work is heavy, bulky, hard to move. Speed up grinding, cleaning, buffing, wire brushing. Four models: 3" to 6" wheel diam.



B&D BENCH GRINDERS handle tool sharpening, grinding, wire brushing, buffing. Ideal when you can bring the work to the tool. Strong steel wheel guards, recessed 2-pole push-button switch, other safety features. Four models: 6" to 10" wheel diam., ¼ to 1 h.p.

B&D POLISHERS have correct speed and power for polishing stainless steel, furniture, mirrors and many other industrial products. Three models for everything from intermittent to continuous service. 7" automatic model has exclusive automatic polish feed.

These B&D ABRASIVE TOOLS have speeded up jobs for thousands of plants!

Take it from thousands of users—you'll cut costs, speed up abrasive and finishing jobs when you put Black & Decker Tools to work in your plant! Big choice of models means you get the *right* tool for *every* job. And you get such world-famous features as: (1) Dependable, full-powered motors tailor-made by Black & Decker for the tools they drive; (2) Perfect balance for easy handling, less worker fatigue; (3) Tough, longer-wearing parts for extra years of service and lower tooling costs!

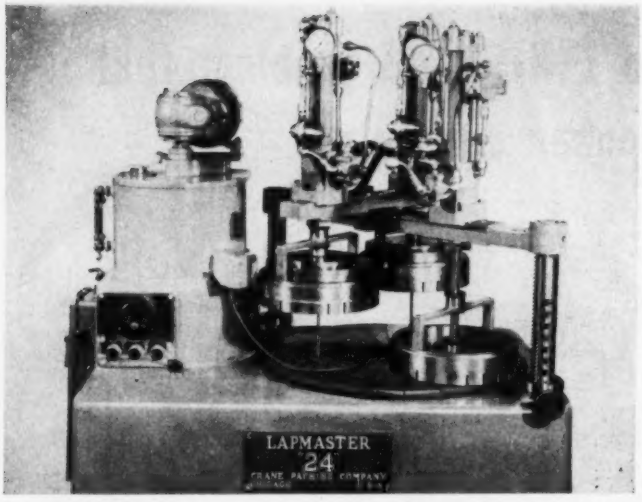
See your nearby B&D Distributor for expert help in solving your tooling problems. Write for free catalog of over 100 Electric Tools to: THE BLACK & DECKER MFG. CO., 616 Pennsylvania Ave., Towson 4, Md.

LEADING DISTRIBUTORS EVERYWHERE SELL

World's Largest, Most Complete Line

B&D **Black & Decker**

PORTABLE ELECTRIC TOOLS

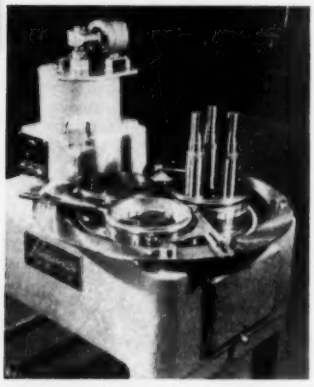


Pneumatic lifts for raising and lowering the combination conditioning-ring, pressure- plate units. Attachment speeds handling of small parts

Attachments for Lapmaster Speed Production of Special Parts

Two special attachments for the Lapmaster, a roller and bar fixture and pneumatic lifts, are said to speed production and simplify handling of certain types of parts.

In this lapping machine, parts are held inside micarta workholders which fit into conditioning rings. These rings float on the lapping plate, and revolve on their own axis from the action of the rotating plate. Their function is to hold the work, and at the same time, continuously condition the lap plate, thus eliminating downtime for dressing. A compound-vehicle mixture is continuously agitated in a mixing tank, and then flowed automatically to the plate throughout the lapping cycle.



Roller attachment for retaining and adjusting the conditioning rings. It allows lapping the end of the long parts shown in the ring at the right

In the standard models, the conditioning rings are adjusted to maintain flatness of the plate by means of an overhead spider-bar fixture. With this arrangement, however, parts longer than the distance between the spider and the lapping plate cannot be handled. To get around this difficulty the roller and bar attachment was developed. It makes use of brackets mounted outside of the circumference of the lap plate. Elongated slots allow adjustment. In most cases the parts are large enough so that pressure need not be exerted against them, ie, they lap of their own weight.

When large numbers of small parts are lapped, the pneumatic lift attachment facilitates loading and removal of the parts and workholders. Each contditioning ring and pressure-plate unit is individually raised. When the automatic cycle stops, the lift is raised, finished parts removed, and preloaded workholders placed in position. The lift is claimed to eliminate more than 2/3 the handling costs.

Crane Packing Co., Dept. G-22, 1800 Cuyler Ave., Chicago 13, Ill.

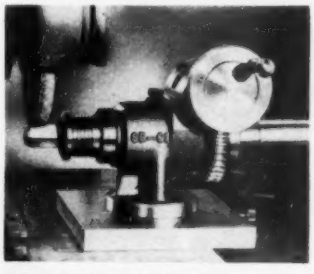
Small Sand-Blast Cabinet Employs Soft Abrasives

Small parts such as dies, tools, pistons, and piston rings can be handled by this cabinet. It includes two lights, an exhaust fan and a dust bag.

Soft abrasives, such as ground corn cobs or nut shells work best when used in the cabinet although sand and metal can also be employed.

It has two rubber sleeves and gloves for both arms of the operator, and measures 14x17 in.

The W. W. Sly Manufacturing Co., 4700 Train Ave., Cleveland 2, Ohio



Allan Lathe Attachment Performs Many Jobs

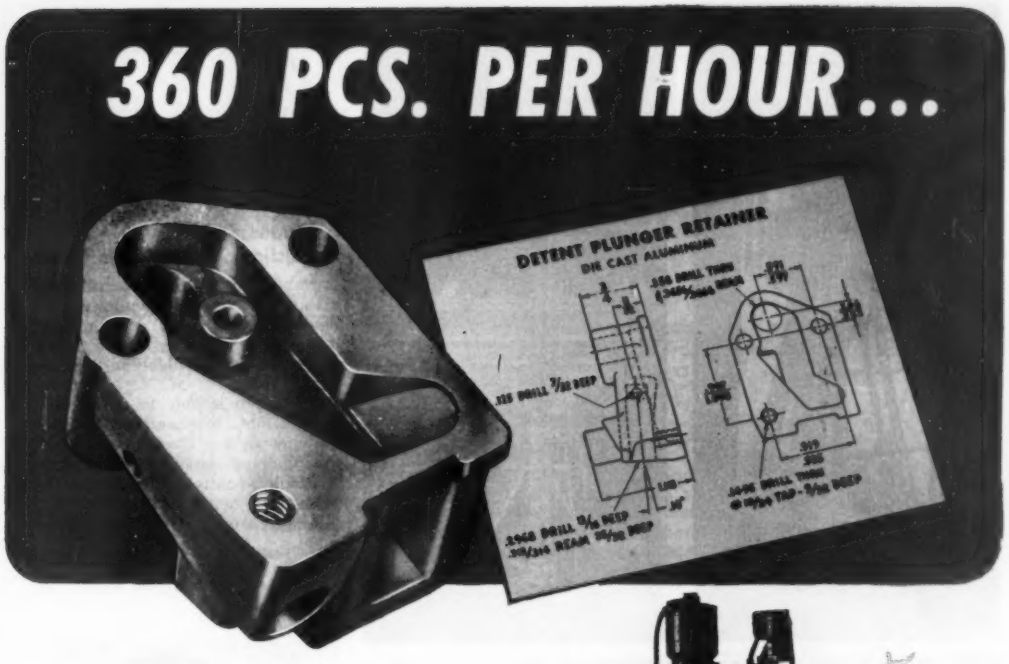
The Du-Ona-Lathe rotary attachment can function in many different roles. It can be used for jig boring, drilling, reaming, flycutter facing, and jig and fixture work. It is claimed to be accurate to 1/10 of 1 degree.

Another use is the holding and positioning of work when surface grinding. Triangles, hexagons, and unusually shaped punches and tools can be ground.

A Meehanite cast-iron body provides a rigid mounting. The attachment will fit all 9-in South Bend lathes.

Allan Mfg. Co., 22-76 Steinway St., Long Island City 5, N. Y.

360 PCS. PER HOUR...

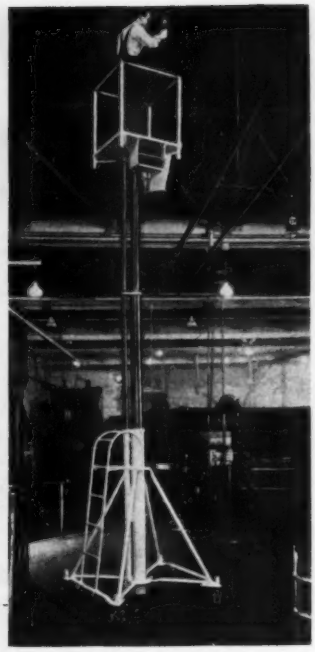


drilled, reamed & tapped on this ➡ Hartford Special Automatic Drilling & Tapping Machine

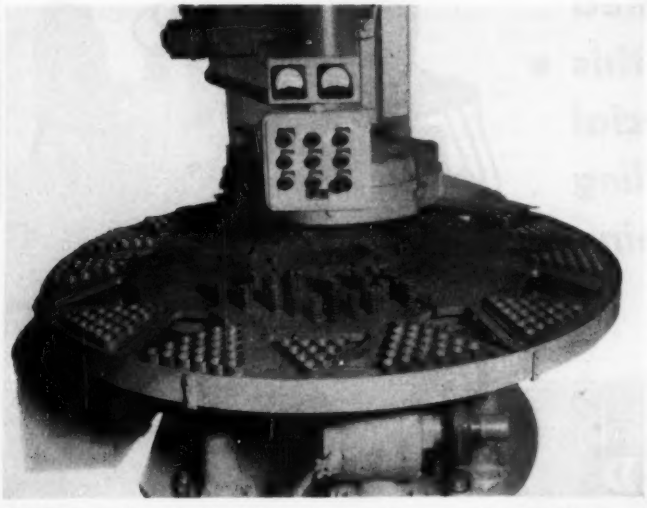
HARTFORD *Special*

Write for New Bulletin

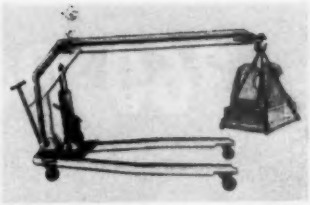
THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 12, CONNECTICUT



MOBILE WORK TOWER attains a max. height of 17 ft. Platform rises 10 ft in 25 sec through extension of a hydraulic ram. Pump is operated by a battery-powered electric motor. Called the Moto-Lift, when telescoped, it can pass through doors 7 ft high by 30 in. wide. Safety tube parallel to the elevating column eases the platform down in event of hydraulic failure. Capacity is 400 lb, weight 600.—*Safway Steel Products, Inc., 6234 W. State St., Milwaukee 13, Wis.*



GRINDER employs double disks and semi-automatic cycling to process coil springs. It grinds springs from ½ to 6 in. long, from ¼ to 4 in. in diameter, and from 0.0625- to 0.500-in. wire diameter. The springs pass across the center of 30-in.-dia wheels with no center holes. This is said to eliminate down time for dressing, and abrasive loss resulting from wheel truing.—*Charles H. Besly & Co., Machine Tool Division, Beloit, Wis.*

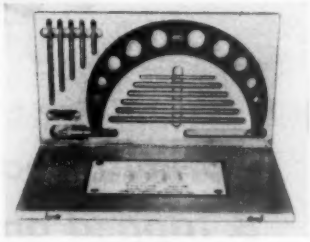


Lower the Boom On Castings With Portable Hoist

Portable hydraulic hoist permits one man to move and handle vehicle power plants, heavy castings, and other equipment up to 5000 lb. Standard models are available in two load capacities.

The boom is able to enter areas inaccessible to overhead cranes. Alignments to a fraction of an inch are claimed because of sensitive hydraulic controls. Loads can be raised to a height of 8 ft 6 in. Ball bearing casters permit easy movement.

South Chester Corp., Dept. H, Finance Bldg., Philadelphia 2, Pa.



Micrometer With Six Anvils Measures From 6 to 12 In.

This one micrometer can be used for all measurements from 6 up to 12 in. by means of interchangeable anvils. Six are furnished, with each one marked to show capacity and fitted with an adjusting collar which compensates for wear and acts as a seat when clamped in position by a locking collar. Wrenches are furnished to make adjustments.

The frame is made from a steel forging and is finished in black enamel. Other features include a one-piece spindle with threads hardened, stabilized, and ground from the solid. A locknut maintains the setting of each reading.

The complete set consists of a micrometer, six interchangeable anvils, six standards, and wrenches packed in a finished wood case. Other measuring ranges are available to 24 in.

The L. S. Starrett Co., Athol, Mass.

Why UNBRAKO "STANDARDS"

"Standards" keep you in the BLACK

Standard design and purchase | Standard tools | Standard (fast) production with "standards" from stock | Standard (or higher) profits

"Specials" put you in the RED

Special design | Special drawings | Special purchase | Special (delayed) delivery | Special stock

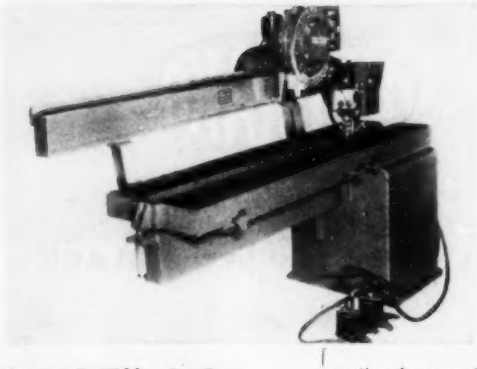
Special tools | Special production | Special bookkeeping | Special costs (higher) | Special profits (lower)

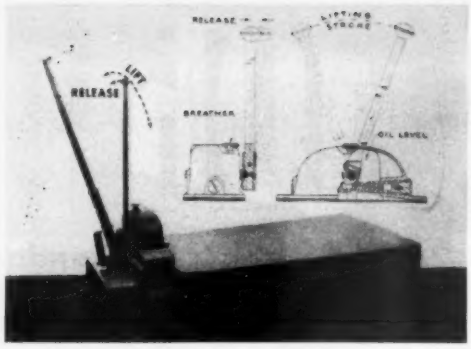
Knurled Socket Head Cap Screw | Flat Head Socket Cap Screw | Self-Locking Knurled Point Socket Set Screw | Knurled Socket Head Shoulder Screw | Fully-Formed Pressure Plug | Precision-Ground Dowel Pin

STANDARD recommends "Standards"

SPS

STANDARD PRESSED STEEL CO.





Automatic Hidden-Arc Seam Welder Has Many Applications

Seam welder automatically joins seams in cylinders or other hollow shapes ranging from 14 gage to ¼ in. A standard machine, it can be adapted to a variety of work. Other uses are in automatic brazing or inert-gas-shielded arc welding on stainless steels and non-ferrous metals. It can be used to splice sheets and through-weld flanges in making containers. Work up to 18 ft long can be handled. Minimum diameter is 12 in. The machine can be extended for longer pieces.

Work is placed over the rigid box-section horn and the two edges of the seam are gripped by pneumatically-operated copper fingers. Clamping pressure of the fingers is provided by air tubes in a hollow box-section weldment on top of the horn.

An air-operated copper anvil clamps tightly up against the back of the welding seam. The fingers and back-up anvil clamp the work in alignment with a minimum of deflection and variation in area through the joint. The machine is made by the Cecil C. Peck Co. of Cleveland, using a Lincolnweld head and carriage.

The Lincoln Electric Co., Cleveland 1, Ohio

Marforge Shop Truck Lifts by Hydraulic Pump

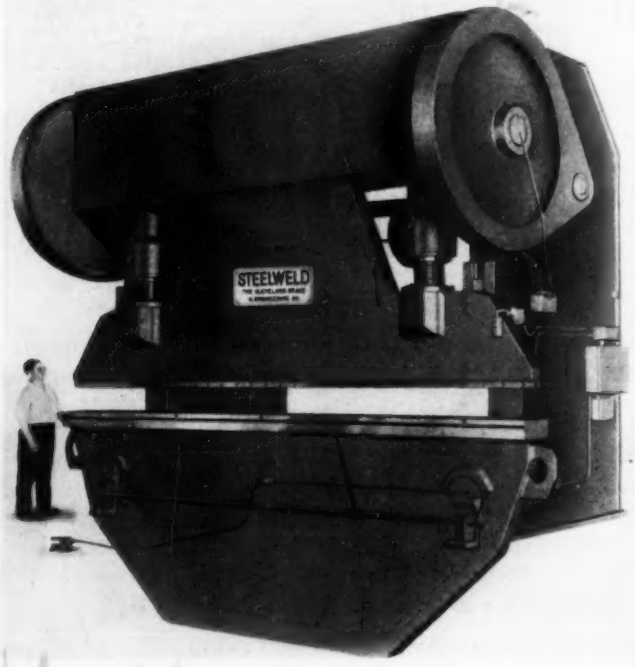
The aluminum single-unit oil tank and pump combination on this shop truck is claimed to raise loads 25% easier and 25% faster.

The hydraulic fluid is contained in the unit above the dual pumps. This allows the fluid to circulate by gravity, rather than being sucked up into the pump from a separate tank underneath.

The one-unit pump eliminates the need for gaskets, dust boot, and needle valves.

The truck is lowered by a simple right-angle flick of the handle. This eliminates stooping or bending to lower loads. A fifth wheel with double ball bearings, and an arc-welded frame construction are other features.

The Market Forge Co., Everett, Mass.



Largest Steelweld Press Bends Mild Plate to 20 ft. x ½ in.

The Model RS61/2-14 Steelweld press is the largest ever made by Cleveland. Railroad-clearance limitations made it necessary to provide a detachable bed which is secured to the machine by resting on saddles at each end and bolting.

It can handle 14-ft sheets between the end housings; has a 6½-in. stroke and an 18-in. throat depth. Over-all dimensions are: length 20 ft, depth 11 ft, height 18½ ft. The bed extends 3 ft 8 in. below the floor.

The machine is operated by an electric air valve controlled by a foot switch, or by pedal or hand lever placed on a cross-shaft in front. The cross-shaft extends nearly the entire length of the press.

The Cleveland Crane & Engineering Co., Wickliffe, Ohio

Remember the political boss of yore,
Who loved to "tap the oil" galore?

But the very same oil, in front of his Wife,
Heated her temper, all through Life.

When you "oil a tap", you'll soon go "berserk"
If you use the same grade for all kinds of work.

Use the right lubrication, according to rule,
And your Bath Tap temper will always stay cool!

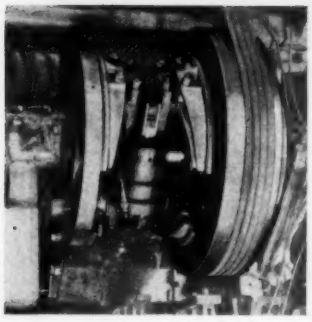
INSIST ON BATH TAPS . . . PROFIT BY THEIR PLUS-PERFORMANCE

When tapping threads, a lubricant is required with the right body, flow and penetration so that the fluid will follow the cut and provide a film to eliminate metallic contact. It should also keep the tap cooled to the proper temperature. Selection of the lubricant should be determined by the type of job, the metal, the machine — and other important factors.

During these critical times, our sales representatives in the field and our engineers have a single desire — to help you speed up production without any sacrifice in quality. The benefit of our threading experience is yours for the asking.

PLUG AND RING THREAD GAGES • GROUND THREAD TAPS • INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED
22 Grafton St., Worcester, Mass.



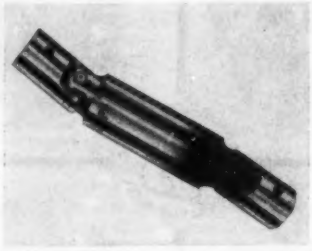
Air-Powered Friction Clutch Saves Maintenance Labor

Accessibility is a prime feature of this combination friction clutch and brake unit. Major saving in down time and maintenance labor are claimed. The reasons given are:

Maintenance cost is reduced because wear is limited to the linings. The disks are bolted in place, instead of floating in teeth or splines. It is said that the linings are automatically withdrawn from contact with the disks, thus eliminating drag. The brake and clutch cannot be engaged simultaneously.

By means of one-piece construction, with the brake operated by pre-loaded springs, air supply or electric-current failure brings the unit to an immediate stop. The model is also available in single-clutch and single-brake units.

Power Presses Inc., 615 Penton Bldg., Cleveland, Ohio



Center Block on Universal Joint Has Reduced Frictional Area

The photo shows the company's low friction universal joint at the top (driving end) and a standard joint at the bottom (driven end) in a dynamometer test with the load and angle increased beyond safe limits. The standard joint shows excessive heating and approching failure, while the low-friction joint ran cool and easily handled the overload.

Two grooves on each of the four bearing surfaces of the center block break each surface into four smaller areas, making 16 bearing faces in all. By reducing the size of frictional areas, wear is said to be more evenly distributed, lubrication transmitted more effectively, and friction heat dissipated, thus increasing joint life and efficiency.

The new joint is available in single- or double-joint form, 1¼ in. OD or larger, solid or bored hubs.

Curtis Universal Joint Co. Inc., Springfield 7, Mass.

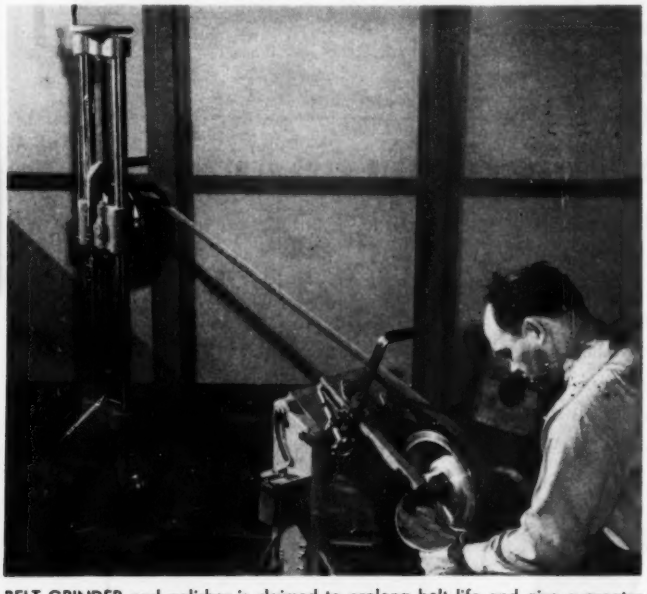
Tornos Automatic Screw Machine For Very Small Screws

Stock capacity	5/32 in.
Max. length	1 in.
Max. headstock speed	12,000 rpm
Max. camshaft speed	120 pieces per min.

The Model TV employs a stopping device which reduces the speed of the headstock spindle to the actual threading speed. The spindle's inertia is thus reduced, permitting a more accurate cut right to the head of the screw. The device consists of a friction clutch controlled by adjustable cams, and it can be set at any time during the cycle of the camshaft.

Combination of 4 radial tools for forming, turning, and cutoff; a sensitive threading spindle; and a slotting attachment of new design are claimed to insure precision screws at high output. A safety device instantaneously stops the machine if anything disturbs the operations. By means of multiple cams, screws of different sizes can be produced without changing the tooling.

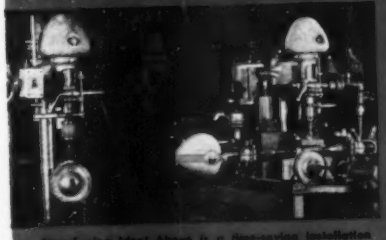
Carl Hirschmann Co., 30 Park Ave., Manhasset, N. Y.



BELT GRINDER and polisher is claimed to prolong belt life and give a greater area of contact through the use of a resilient contact wheel. The wheel may be from 1½ to 18 in. in diameter and made of material such as cloth, soft rubber, felt, hair, or wire. It may be raised or lowered to any desired position. Adjustment feature of rear pulley permits belts from 6- to 14-ft. to be used.—*Stephen Bader & Co., 253 Langdon Blvd., Rockville Centre, N .Y.*

Fit the machine to the drilling job

– instead of making the job fit the machine



Time-Saving Idea! Above is a time-saving installation at The Deming Co., Salem, Ohio.

At the right is a special-purpose unit made up of three standard Delta 14" drill-press heads — two mounted horizontally and one vertically. All three drill holes in a casting at once, automatically.

While the machine is drilling, the operator takes the casting which has been drilled already and runs holes with the single-spindle Delta drill Press at the left. Thus, he makes use of what is otherwise idle waiting time.

DELTA—the world's most complete line of light machine tools
FIRST IN SELECTION!
FIRST IN QUALITY!
FIRST IN VALUE!

You CAN with Delta® Multiple-Spindle Drill Presses

You can have any number of spindles on sectional tables joined together — in batteries a block long, if that's what the job calls for. You can have either 14" or 17" heads — or both — spaced the way you want them. Sections have a 3¼" trough. End sections are tapped for a drain.

Delta-Milwaukee Multiple-Spindle Drill Presses are furnished also in 2- and 4-spindle models with one-piece tables. Multiple-spindle models are available in ½" and ¾" capacities in cast iron.

Take advantage of Delta quality, economy, accuracy, and flexibility, in planning your special drilling equipment. Delta's engineering service is always ready to help. Send for details.

Sold only through authorized dealers — available on easy time payments. Look for the name of your Delta dealer under "Tools" in the classified section of your telephone directory.

DELTA POWER TOOL DIVISION
Rockwell
Manufacturing Company
MILWAUKEE 1, WISCONSIN

Tear out coupon and mail today!

Free...
6 TIMES A YEAR
The Power Tool Journal — packed with detailed job data, fully illustrated — handbook of time- and money-saving shop ideas.

Delta Power Tool Division
ROCKWELL MANUFACTURING COMPANY
600 E. Vienna Ave., Milwaukee 1, Wisconsin

Send me free —
☐ The Power Tool Journal—6 times a year.
☐ Catalog and bulletins on complete Delta line.

Name_____
Title_____
Company_____
Address_____

Tiny holes? . . . . . Easy!

Accurate holes? . . . . . Easy!

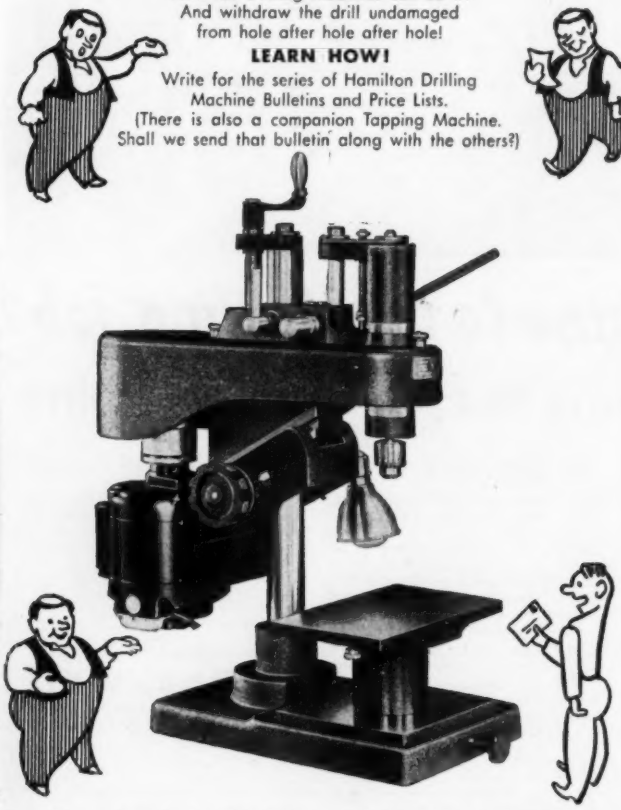
Holes on production schedules? . . . . . Easy!

Tiny, accurate holes on production schedules? . . . WOW!

Hamilton Drilling Machines can do it!
And withdraw the drill undamaged
from hole after hole after hole!

LEARN HOW!

Write for the series of Hamilton Drilling
Machine Bulletins and Price Lists.
(There is also a companion Tapping Machine.
Shall we send that bulletin along with the others?)



Shown here is the Hamilton Varimatic, Super Sensitive, Variable Speed, Small Hole Drilling Machine, one of four models, each particularly adapted to the work for which intended, all equally precise.

THE Hamilton TOOL COMPANY
830 SO. NINTH STREET • HAMILTON • OHIO • U • S • A

ROUND TABLE Discussion

HEAD BEATS HANDS

BEING AN infernally lazy man myself, I go along with Al, and say, "Give the lazy man a chance."

It is true, however, that the lazy man who does not produce, who "goofs off" and gets away with it, for whatever reason, can raise hob with morale, whether in plant or office. This might indicate then, that there are two varieties—possibly more—of laziness: the loafer who does the least that the law allows, and the lazy man who believes that the head can beat the hands, any time.

There is a variation of an old saw, which goes, "Laziness is the mother of invention." That this is undoubtedly true is borne out by checking into the history of machines and machine tools. A young man named Humphrey Potter won a place in history because he was too blamed lazy to work the valves on Newcomen's engine—he rigged up strings to do it automatically. Some lazy genius in the dim past invented the wheelbarrow because he was too lazy to carry whatever he had to carry. The present-day example is the man who was too lazy to shift gears on his car and invented the automatic shifter—bless his heart.

I say again, with Al, "Give the lazy man a chance—but not the loafer."

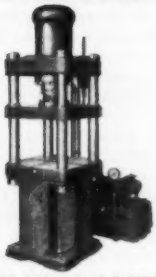
Donald P. Holmes
Oakland, Calif.

•

YOU CAN'T always tell what goes on in the brain of one who apparently is of a lazy nature. Undoubtedly the chief objective is to get out of as much motion (muscular effort) as possible. Laziazell, the surprise package who picked up production of crank levers, called upon this part of his makeup in order to relieve himself of a certain amount of work. Butters, the speed demon, while turning out the crank levers satisfactorily was evidently working on his nerves, turning out pieces perfunctorily while happily reflecting upon the swell time he had the night before—using no mental effort whatsoever because of his work. Laziazell thinks his way through his muscular difficulties to such a degree that production is increased as a

HANNIFIN OFFERS... to help You SPEED PRODUCTION

TECHNICAL DATA



HYDRAULIC PRESSES

1 Ton to 200 Tons
Many Types
82 Standard Models!

"HY-POWER" TOOLS

Riveters • Punches • Presses
Portable or Stationary
Capacities to 100 Tons

AIR PRESSES

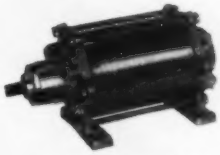
59 Different Models!
1/2 ton to 18 tons

HYDRAULIC CYLINDERS

The Standard for Quality!
12 Sizes — Many Styles

Field Engineers in All Leading Industrial Centers

SOMEWHERE in Hannifin's broad line of air and hydraulic machinery and equipment are products you may be able to use in meeting today's need for faster, more efficient production. To help you select the items you can use, Hannifin catalogs and bulletins are packed with technical data, complete as to dimensions and ratings, thorough! We invite your inquiry on any of our lines that may interest you.



AIR CYLINDERS

12 Sizes — 1" to 16"
Choice of Mounting Styles

AIR CONTROL VALVES

Latest and Newest Types!
Hand • Foot • Electric

BULLETINS AVAILABLE

● Following is a partial list of bulletins Hannifin offers to help you:

- ☐ "Hannifin Hydraulic Presses", Bulletins 130, 134, 135.
- ☐ "Hy-Power Hydraulics", Bulletin 130.
- ☐ "Hannifin Hydraulic Cylinders", Bulletin 110.
- ☐ "Air Control Valves", Bulletins 57-W, 230, 236, 240, 241.
- ☐ "Hannifin Air Cylinders", Bulletin 210.
- ☐ "Air Operated Presses", Bulletins 250, 251, 252.
- ☐ "Hannifin Air Vises", Bulletin 280.
- ☐ "Air Warden Pressure Regulators, Filters and Lubricators", Bulletins 1005A-1010B.

Hannifin Corporation

1117 So. Kilbourn Ave. • Chicago 24, Ill.

No production-line bottlenecks . . . and no hold-up in filling DO's since the grinding supervisor started using Simonds Abrasive Company wheels. No wonder he's pleased. You'll find plenty of satisfaction . . . and serviceability too . . . in these efficient production tools. Send now for free data book describing Simonds grinding wheels, mounted wheels and points, segments and abrasive grains . . . products proven in everyday industrial use . . . and backed by Simonds 50 years experience as a major grinding wheel manufacturer.

SIMONDS ABRASIVE CO.
grinding wheels

SIMONDS ABRASIVE CO., PHILADELPHIA 37, PA. BRANCH WAREHOUSES: CHICAGO, DETROIT, BOSTON
DISTRIBUTORS IN PRINCIPAL CITIES

Division of Simonds Saw and Steel Co., Fitchburg, Mass. Other Simonds Companies: Simonds Steel Mills, Lockport, N. Y., Simonds Canada Saw Co., Ltd., Montreal, Que. and Simonds Canada Abrasive Co., Ltd., Arvida, Que.

result of the motions he saves. If Butters could incorporate Laziazell's short cuts into his methods one could readily see where there would be a remarkable increase in the production of crank levers.

It looks as though Laziazell has become a necessary asset in the production line! No doubt that the lazy boy is an exception and by mere chance has pulled the rabbit out of the hat, however, it just goes to show that there is good and bad in everything. The speed demon rests upon his laurels and carries on in a rut, as it were; he is evidently satisfied with what he is doing while the work-eliminator gets around his difficulties through an active head that concentrates on the work at hand.

One must be pretty careful that the lazy boy doesn't fall asleep on the job as so happened to a friend of mine almost 50 years ago. This chap was operating a radial drill press and evidently dozed off momentarily while standing at his post of duty. As a consequence of his fleeting nap his shirt sleeve caught on the spindle and before he could summon energy enough to yell for help his shirt, overalls, and red flannels wound themselves tightly around the revolving spindle. All Curley was attired in, by the time the machine was brought to a stop, was a suspensory, a pair of light-green socks, and a couple of shoes.

By the time Curley (Scardazell) felt the cold air of exposure he had learned one great and invaluable lesson: don't go to sleep on the job. It took Curley about three months to regain his normal attitude and the peach color didn't return to his blanched face for another three on top of that. Between the three—Butters, Laziazell, and Scardazell—we have the three fundamentals of effective production: perfunctory operating, scientific analysis, and safety first.

J. Homewood
Ontario, Calif.

•

A FEW years ago the boss asked the foreman to whom he was speaking who that lazy looking fellow was who had just passed. "Oh, that was Jones, he is our star; he is the man who has just won your award as the fastest workman in the department." Replied the boss, "By his movements, one could have thought he was the slowest."

What a mistaken idea, and how unwise to base such a superficial judgment on an unrelated premise. Machinists are not good because they can sing, jump, or run; rather they

ARE YOU

- CHANGING YOUR PLANT LAYOUT?
- MAKING NEW PRODUCTS?
- ADDING NEW MACHINERY?
- GETTING A NEW BUILDING?
- OVERHAULING YOUR BUILDING?

Save Floors . . . Protect Buildings . . . Increase Machine Life . . .

ANCHOR ALL YOUR MACHINES ON

UNISORB®

UNISORB requires no bolts, no lag screws . . . eliminates old-fashioned, destructive floor drilling.

UNISORB absorbs 60-85% of all transmitted machine vibration and noise . . . often permits higher machine speed, increased production . . . reduces employee fatigue . . . lessens vibration strain on buildings, floors, machinery.

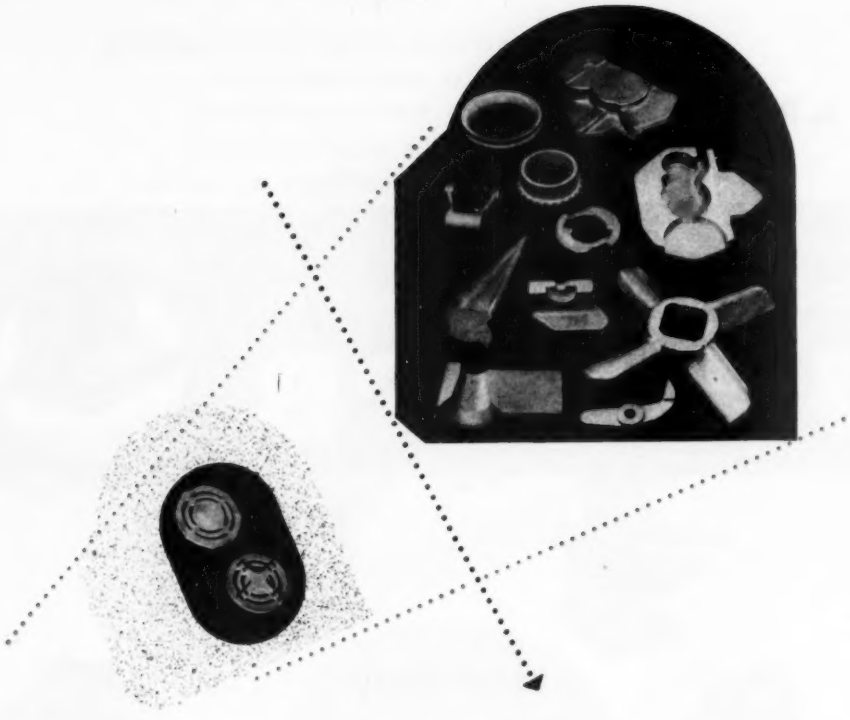
GET THE FACTS . . . ALL THE FACTS . . . ON UNISORB . . . WRITE . . . TODAY

THE FELTERS COMPANY

210-N SOUTH STREET, BOSTON 11, MASSACHUSETTS

Offices: New York, Phila., Chicago, Detroit, Cleveland, St. Louis
Sales Representative: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.; New York City

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



Airkool Sand Castings

increase valve life **10** *times!*

A big-name refrigeration compressor company recently decided to redesign their equipment to increase the power rating by 33⅓. That meant the performance of the suction and discharge valves had to be improved. These valves are 3- to 4-inch diameter discs about ¼" thick with a number of radial slots closely controlled in width and shape for regulating gas flow volumes.

These valves were formerly made in cast iron, but frequent breakage in service, and excessive wear ruled out cast iron for the improved compressors.

Crucible metallurgists were called in and met the challenge with Airkool Sand Castings specially designed for the valves. Airkool is a Crucible air-hardening tool steel noted for abrasion resistance and excellent non-deforming properties during heat treatment. By closely controlled foundry technique, the slots in the casting were held to the close tolerances needed. Expensive machining was avoided, and the valve not only gave improved performance, but its life was *increased more than 10 times.*

If you have a sand castings application, call on us. CRUCIBLE STEEL COMPANY OF AMERICA, General Sales and Operating Offices, Oliver Building, P. O. Box 88, Pittsburgh 30, Pennsylvania.

CRUCIBLE first name in special purpose steels

51 years of Fine steelmaking **SAND CASTINGS**

REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

will be judged by their ability to produce, and if any man can do this better than others by standing on his head then good luck to him; inquire if he has a similarly constituted brother.

It is reported that in the early days of the steam engine, a boy had to open and close the valve for steam admission and exhaust. He got tired of this monotonous job and connecting a cord to the valve rod or handle with a revolving member of the mechanism, saved himself trouble and, incidentally pointed the way to mechanical valve operation. No, it does not follow that deliberation is an indication of laziness anymore than an exhibition of fuss or bustle connotes the existence or use of brains.

I remember a head foreman, appointed through influence rather than for his ability, who rushed through the works like a whirlwind. He criticized right and left; gave no help but just found fault. His brightest achievement after growling at a foundry foreman whose cupola was cold waiting for a new fireclay lining was, "if you had any interest in your job you would get and cast a lining." Poor fool bustle but no brains. Could he have been connected with the nation mentioned by Phaedrus, a Greek philosopher, which was "rushing hastily to and fro busily engaged doing nothing."

Once a foreman gave one of his favored men what was thought to be a good paying job. There were a thousand pieces to be done. The job was lightly started, and as lightly finished. They were all scrapped. The job was then given to a nonfavored man not with a blessing. He took a day to start it; devised a foolproof method; all his pieces were accepted and his time taken was less than that taken for the pieces scrapped. Many a man's slow start has been mistaken for idleness but the tortoise beat the hare and some of the Laziazells may still beat the "speedy" hares. At the same time slowness itself is not a virtue, nor is speed of action alone. Only results count and laziness gives none.

P. E. James
Lindum, England

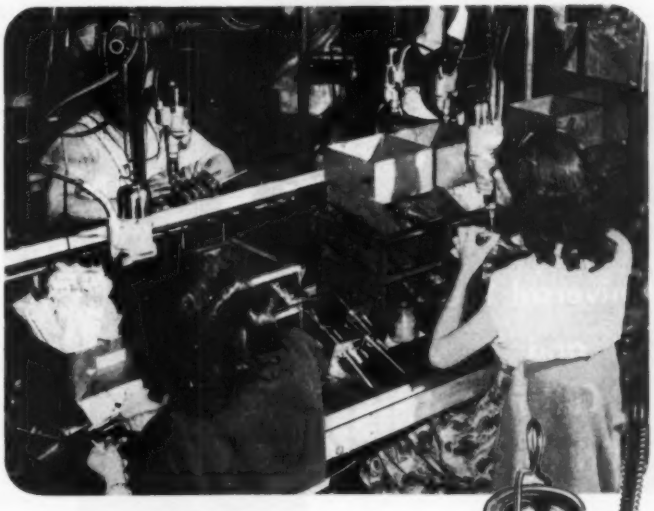
•

FIRE OR FIZZLE

Ed is all upset. He fired a man named Potts, and the personnel office instead of letting him go looked around the plant and found an opening that Potts might fit, and apparently everybody is happy except Ed.

One of the main reasons that justify the expense of maintaining a

SOCK
with a velvet touch . . .



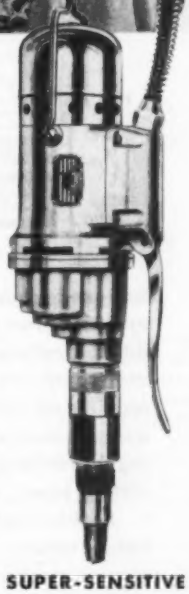
. . . speeds electronics production

Plenty of power is needed to start and drive self-tapping screws fast on electronics assembly lines. But torque must be accurately controlled or threads strip, delicate electronic parts crack.

That was the problem a leading electronics manufacturer faced. Other drivers were tried. But it took the versatile Millers Falls No. 50 with patented "Adjustomatic"® Clutch to solve the problem.

Each day, 46 of these powerful, super-sensitive tools are driving 57,000 nuts and screws — quickly, quietly, efficiently — with torque held within a fraction of an inch-pound.

Velvet smooth and vibrationless . . . Millers Falls "Adjustomatic"® Screw Drivers will handle even the most delicate work. Yet they give you all the punch and endurance needed for continuous, high speed operation. Write today for full details and a demonstration on your own work. Millers Falls Company, Greenfield, Mass.



SUPER-SENSITIVE

No. 50 Screw Drivers with "Adjustomatic"® clutch star on hundreds of assembly lines. Other high production Millers Falls electric tools include: Drills, Positive-Clutch Screw Drivers, Nut Runners, Stud Setters, Bench and Portable Grinders, Buffers, Polishers, Sanders, Hammers, Circular Saws.

MILLERS FALLS TOOLS
SINCE 1868
The Mark of Superiority

Keep Tools Sharp For High Production

With **OLIVER ACE** Universal Tool and Cutter Grinders

2 MODELS:
Standard and
Heavy Duty (illustrated).

Designed to give guaranteed accuracy on high speed and tungsten carbide work—the OLIVER ACE grinds difficult cutters easily. Simple to set up, easy to operate, faster on most grinding operations, the ACE requires no computation—has direct reading for clearance. Its uses are almost unlimited. It excels for grinding face mills up to 15" • slab mills • end mills • slitting saws • dovetail cutters • angular cutters • double angle cutters • gear cutters • Fellows helical cutters • reamers • taper reamers • production gashing. AND the OLIVER ACE is priced to meet your budget.

Write For Illustrated ACE Catalog

OLIVER INSTRUMENT CO.
1414 E. MAUMEE • ADRIAN, MICHIGAN

AUTOMATIC DRILL GRINDERS
TOOL & CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—REMAKING MACHINES

personnel office is such an instance, where supervision takes an unfair advantage of the position they occupy and try to prevent Potts being placed elsewhere. The personnel office is in the position similar to a referee or umpire. He acts as a buffer, counsellor and advisor, and fills a very vital role in factory relations between supervision and employees.

With regard to Ed's statement that he is going to enlighten the new Boss that Potts is working under, I don't believe that anything more despicable could be done.

An evaluation interview can be useful in saving good workers for other departments providing the foreman making out the evaluation is a highly capable and honorable-type man and contents himself in giving a true statement. It should be borne in mind that starting of any new man from outside costs real money, and turnover of employees is highly expensive. There are lots of instances where a chap has not settled down for some reason or other, and has been transferred from one department to another, and has become a highly valued employee.

Arthur Silvester
Niantic, Conn.

•

THE RETENTION of an employee, who has been guilty of insubordination, is nothing short of a slap in the face to the foreman who discharged him from his department. The department of personnel is playing with fire when it babies along a worker by placing him somewhere else about the plant when the man has shown by his actions in one department that he possesses a quality in his makeup that is inimical to the interest of the firm.

One of the valuable functions of the personnel department is to reduce turnover as much as possible.

"Just where was it you said you learned how to use gage blocks, Hartwood?"

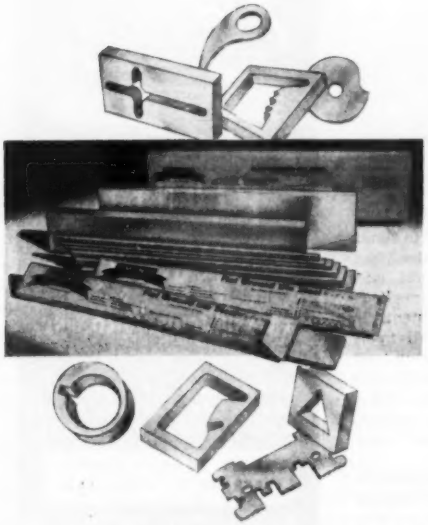
You're over the HIGH HURDLES Before You Start

WHEN YOU USE

SIMONDS

Flat Ground Die Steel

to make dies, punches, parts, etc.



Blue it . . . mark it . . . saw it . . . that's all you have to do with "Red Streak" Die Steel. And look at all the things *you don't have to do:* You don't have to buy oversize bars and then waste metal grinding them down. You don't have to square the ends . . . for these are accurately finished and precisely square. You don't have to machine the flat sides, either. And you don't have to worry about heat-treating . . . for "Red Streak" Die Steel is *spherodized*-annealed to eliminate hard spots . . . to give a uniformly soft structure for easy machining and uniform harden-ability.

Yes, your toolmaking or parts-making job is about half done before you start . . . when you start with Simonds Flat Ground Die Steel. Order from your distributor today . . . he has it in all standard sizes.

SIMONDS SAW AND STEEL CO.

Branch Offices in Boston, Chicago, San Francisco and Portland, Ore. Canadian Factory in Montreal, Que.

ENGINEERS

TO DESIGN, REDESIGN, OR DEVELOP YOUR PRODUCT

ENGINEERS

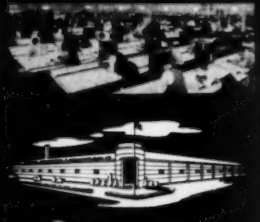
TO TOOL AND EQUIP YOUR PLANT FOR THE BEST PRODUCTION ECONOMICS

ENGINEERS

TO GET YOUR NEW PRODUCTION GOING AND KEEP IT GOING

ENGINEERS

TO REDUCE YOUR COSTS AND IMPROVE YOUR QUALITY



PIONEER ENGINEERING

& MANUFACTURING CO., INC.

ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

19651 JOHN R STREET
DETROIT 3, MICHIGAN

INQUIRIES PROMPTLY ANSWERED

However, the "loss of face" greatly outweighs the cost caused by the ousting of an unfit employee. To ignore the foreman's judgment as to the fitness of an employee is decidedly a slipup on the personnel department. There are times, of course, when a foreman may be the direct cause of some rash act which incites the worker to unethical conduct. Fortunately these times are few and far between. In such instances the matter should be taken up by a board of inquiry to decide upon the justice or injustice of the foreman's action.

Assuming that Ed were justified in tying the can to the tail of the recalcitrant Potts, and taking into consideration that perchance the fellow who blew his top could fit in more agreeably in another department, would it not be the part of wisdom to exercise a period of probation in which the guilty one could sweat it out? The chances are that the industrial outlaw would see his mistake and make restitution in the form of an apology to the one with whom he was at cross-purposes.

I would like to see the personnel department take Mr. Potts in hand and make him see the error of his ways; I don't think much of their action, which as much as tells the offender that Ed isn't as much of a big shot as he thinks he is. Everything should be done to maintain the prestige of the department heads; this certainly cannot be accomplished by leaving one of the foremen out on a limb as was done in Ed's case.

If I were a member of the personnel department I would handle the Potts affair in this fashion: "Potts," I'd say, confidently like. "Potty, old boy," I'd repeat (this is high-class personnel psychology in order to gain the good will of the man getting the hot iron) "there's an element in your makeup that doesn't fit in with the smooth-running of our establishment. It may be that you will be able to land another job somewhere else, but in the event that you do not, and have thought through your uncalled-for action in Ed's department, it may be that we can prevail upon him to consent to your being put into another (at this point I'd tap him gently on the knee and raise a finger of emphasis). You realize, Potts, that this is contingent upon an apology to Ed."

We can't afford to make a foreman look like a jackass simply because one of his men chooses to act like one. Don't I know what's good for

PUMPS

FOR COOLANTS, LUBRICANTS, AND ABRASIVE LIQUIDS

PUMPS

POSITIVE DISPLACEMENT AND IMPELLER TYPES

PUMPS

J. I. C. STANDARDS OR DIRECT MOTOR CONNECTED

PUMPS

FOR TWENTY YEARS—DEPENDABLE, ECONOMICAL, EFFICIENT

Pioneer

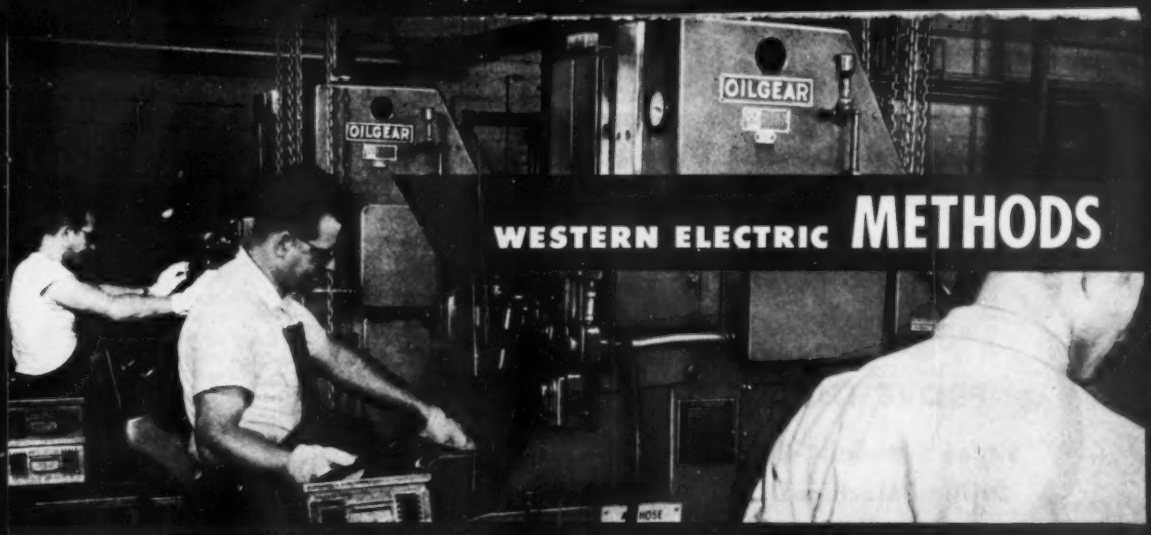
PIONEER PUMP

& MANUFACTURING CO., INC.

STANDARD OR SPECIAL, FOR EVERY MACHINE TOOL AND INDUSTRIAL USE

19681 JOHN R STREET
DETROIT 3, MICHIGAN

WRITE FOR CATALOG



WESTERN ELECTRIC METHODS

INCLUDE OILGEAR MACHINES FOR BROACHING STAMPINGS

7 OILGEAR VERTICALS AT CHICAGO

The Western Electric Company, outstanding in the manufacture of all types of telephone equipment, has used Oilgear Broaching Machines since 1928. Some of the Vertical Surface Broaching Machines shown above have been in service more than 10 years. The machines in the upper panel finish broach four edges on stampings for crossbar switches. Production for each machine is in excess of 600 pieces per hour. The Oilgear Verticals in the lower panel finish broach two knife edges on steel stampings used as the armatures of crossbar relays. Here too production from each machine is more than 600 pieces per hour.

Oilgear Broaching Machines offer you many advantages as standard which are exclusive with Oilgear or are to be found elsewhere only at extra cost.

Oilgear Machines are often bought to replace other types of equipment and represent tremendous gains both in initial savings and in greatly increased production. This is true in the case of small factories where every capital investment must be carefully made, and in the case of large industrials where production is largely given over to semi-automatic and fully automatic machines, and unfailing dependability becomes just that much more vital. It will pay you to investigate what Oilgear Broaching Machines can do for you. THE OILGEAR COMPANY, 1563 W. Pierce St., Milwaukee 4, Wisconsin.

Oilgear

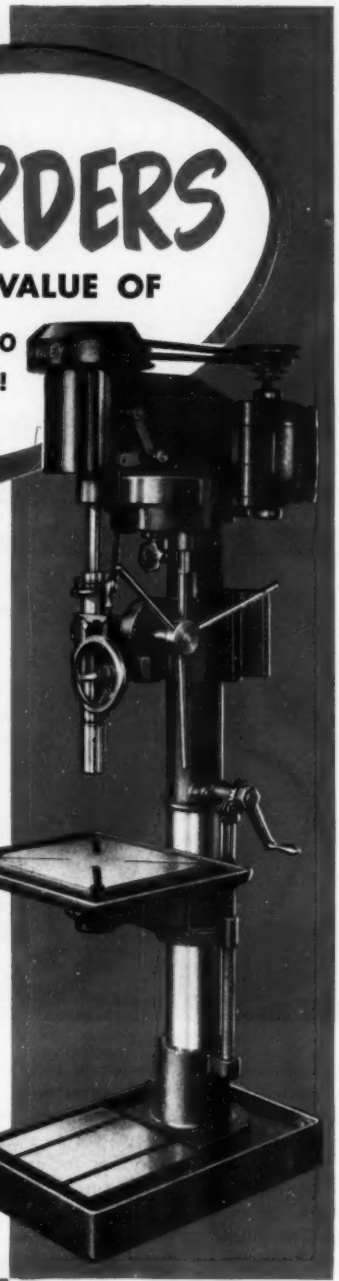
PIONEERS IN FLUID POWER

BROACHING MACHINES AND PRESSES

RE-ORDERS

PROVE THE VALUE OF

Sibley's Model C-20 Drilling Machines!



Nothing demonstrates customer satisfaction more than repeat business—and judging from the repeat orders for the Model C-20, customers have found it to be a real cost and time saving investment.

On the market now for two years, this 20" swing machine has been tested in toolrooms and on production in hundreds of plants—and customers acclaim it as the finest drilling machine for its capacity they've ever operated.

There are good reasons for this acceptance! Operation is so effortless—geared power feeds are selected by turning a knob; spindle speeds range from 65 to 1360 R.P.M.; its capacity of 1¼" in mild steel handles a large variety of drilling jobs.

OTHER SIBLEY MODELS

Model E-25 medium weight with 25" swing and ¾" capacity in mild steel. Heavier Models D-24 and D-28 in 24" or 28" swing with 1¾" capacity.

Don't Delay —write for specifications today!

SIBLEY
MACHINE & FOUNDRY CORP.
24 EAST TUTT STREET
SOUTH BEND 23, INDIANA

SIBLEY MACHINE & FOUNDRY CORP.
24 E. Tutt St., South Bend 23, Indiana
Send Catalog No. 67

Name _____ Title _____
Company _____
Address _____
City _____ State _____

the man. As a young squirt full of buckshot and lard oil I pulled one of these unforgivable sins—unthinkingly, of course. The foreman handed me the well-known yellow slip of disgrace and I, trying to protect my pride, immediately tore it up in front of him and with a sneer I said: "You can't fire me; I'm quitting." "You're damn right you are," he laughed as he walked to his chair. Needless to say, I went out of that plant like a P40 taking off for Moscow and stayed out. Was I mad! Wow! Years tinged my anger with divine mellowness. In my mind I forgave the foreman and had come to the conclusion that I was decidedly in the wrong. I surrendered to the inevitable and made an effort some years later but I was too late to contact my abused foreman to make amends—the poor guy had relinquished his over-burdened body and spirited himself to the great unknown where harassed foremen and harassing personnel officials live on through eternity, de-harassed in every respect.

Had I been taken in hand by someone sympathetic to my urgent needs (Personnel people were of X value in those days) and placed into another department my life wouldn't have been worth two cents because the old boss would have greatly resented the action and no doubt would have wrapped a casting of some sort around my skinny neck at the first opportunity.

J. Homewood
Ontario, Calif.

•

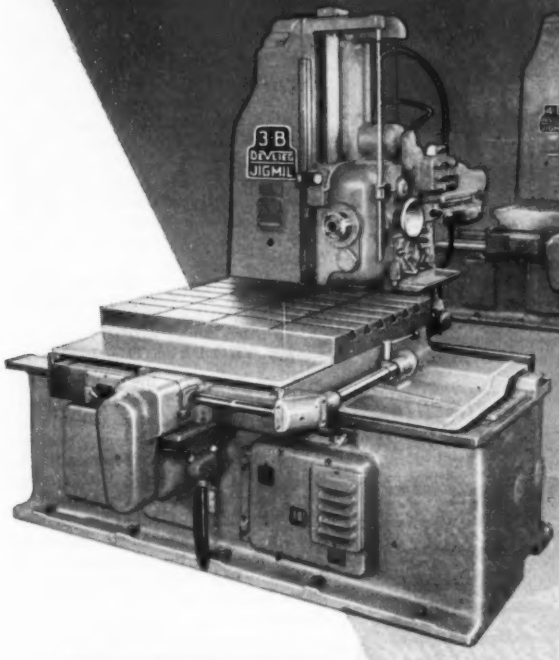
OUT TO PASTURE

MAN OR woman, from infancy to the late 20's, are still in the learning age. Their minds are still flexible. You can teach them anything. They are more daring. They will take chances, go jump from place to place. They are restless.

From the 30's to the 40's they start to settle down, to look for security, and they start to take stock of themselves. In the 40's they are in their prime of life, with strength of body and mind developed. In the 50's there is a period of getting settled, in the 60's they are starting to acquire wisdom, in the 70's they have wisdom acquired through all the years of the being in any occupation or profession. They can do many things with their eyes shut that a youngster will watch and wonder how they do it.

Take the cake that grandmother baked. If you asked her for a recipe, she would have told you to take

THE JIGMIL FAMILY IS GROWING!



A wide range of basic machines for precision boring and milling operations

Send for Illustrated Jigmil Catalog

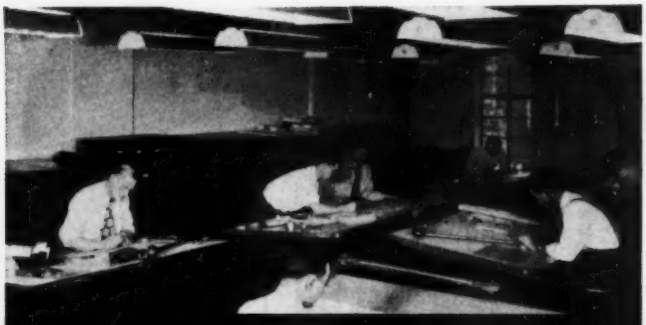
MODEL	BAR DIAMETER	HORIZONTAL TRAVEL	VERTICAL TRAVEL	SIZE OF TABLE
3B	3"	48"	36"	30" x 48"
4B	4"	60"	48"	36" x 60"
3C	3"	72"	37½"	31½" x 72"
		96"	37½"	31½" x 96"
4C	4"	96"	50"	37½" x 96"
		120"	50"	37½" x 120"

"Come to Detroit and investigate the Jigmil Technique"

DEVLIEG JIGMIL

DEVLIEG MACHINE CO.

450 FAIR AVE., FERNDALE 20,
DETROIT, MICH., U. S. A.



Let our ENGINEERING DEPARTMENT Supply the answer to your PRODUCTION ASSEMBLY PROBLEM

Our thoroughly trained engineers are ready to design equipment for your individual needs . . . No package goods . . . Whatever we furnish you will be planned for your particular purpose . . . And our 25 years of specialized experience qualifies us to do your job successfully . . . Thousands of manufacturers have profited immeasurably through greatly stepped-up production as a result of our service. You, too, can benefit likewise by the use of D.P.S. power-driven machines. Get further details. Mail the coupon today . . . Also send sample assembly for production estimate.

AVAIL YOURSELF OF OUR UP-TO-DATE EXPERIMENTAL LABORATORY EQUIPPED TO SOLVE THE "IMPOSSIBLE"!

POWER SCREW-DRIVERS

HOPPER FEEDING UNITS

The SOLUTION may be tied in with one of our FOUR MAJOR PRODUCTS!

NUT DRIVERS

SPECIAL ASSEMBLING MACHINES

MAIL COUPON FOR CATALOG

DETROIT POWER SCREWDRIVER CO.
2797 WEST FORT ST., DETROIT 16, MICHIGAN

Send your catalog and further details.

COMPANY NAME_____
BY _____
STREET ADDRESS_____
CITY_____ STATE_____

1926 Our 25th ANNIVERSARY 1951

DETROIT POWER SCREWDRIVER CO.

some flour, a little of this and a little of that, a pinch of this and a pinch of that, and you will make it as I did. She has so much experience that she does not use any measurements. She knows just when to stop putting flour in and the other ingredients. That takes experience. Her subconscious mind tells her how much to use of each.

That is the same with any good man in his line. When he is old he has acquired wisdom and knowledge of his job. Thus, Ed realized that it would have been a great loss to the organization to put Harrison out to pasture. Instead, he utilized Harrison's knowledge and ability and wisdom by giving him the job of supervision of apprenticeship where he will be able to pass his knowledge to the younger men.

No younger man has the knowledge that Harrison has. He is 65 years old and in his last 45 years of service he garnered knowledge at his finger tips that a younger man does not have. To Harrison it is a relaxation to teach. He is proud of the opportunity to pass his knowledge to the younger men. He is proud that he is made a supervisor and he will do his best for the corporation.

Michael Axler
New York

•

HE WHO PAYS THE PIPER

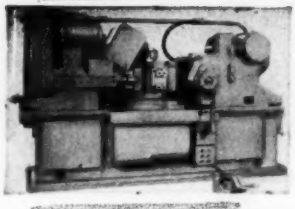
YES, HE who pays the piper should call the tune and if the object is only to keep in step, not to do so could be an unpardonable offence. Seeing, however, the idea of keeping time is but a simile, and that in this case, keeping step is not and ought not to be an end in itself, could not the discussion be broadened to bring in other phases of the same subject for consideration, there being many.

To grumble when output has been increased in any legitimate manner seems to be sheer lunacy, while a complaint that there was more power being used and more wear and tear of the machines concerned would appear to be hopeless imbecility. Such an employer might consider offering a bonus on the basis that he who did the least work used least power and saved wear and tear. He might go further; do no work; keep his machines brand new and saves Al wear and tear.

The object should be always the largest volume of output. In this country, both trade unionists and employers have been guilty of not trying to give or encourage the best standard of output. Each side seems, at times, to have bad opposing ob-

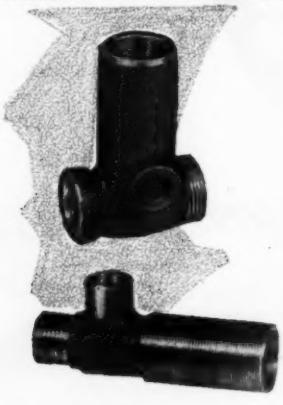
N
W
E
S
BAY STATE
BAY STATE
BAY STATE

GOSS and DE LEEUW
AUTOMATIC CHUCKING MACHINE



means a complete piece... at each index cycle

When a piece is finished it is *completely* finished without the necessity of a second operation. Furthermore it means *more* finished pieces in a given period of time and greater accuracy in *every* finished piece.



The "1-2-3" Method is exclusive with Goss & DeLeeuw. With it, three ends of a piece can be machined at a single chucking of the work, simultaneously or in sequence depending on the operations involved. It will pay you to investigate.

Send for illustrated literature giving detailed information. Send samples and ask us to give you cost estimates of handling this work on a "1-2-3" Goss & DeLeeuw Automatic Chucking Machine.

GOSS & DELEEUW QUALITY PRODUCT GUARANTEED

GOSS and DELEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

jects; the one, minimum output at highest wages—cost; the other maximum output at minimum wages. The writer in his younger days has been threatened by his fellows for doing too much and has had his basis of earnings reduced for earning too much. Not more silly than the Danish company.

Long views are desirable, and fair play. Some firms take advantage of the suggestion box. In one case, a young man made a suggestion which had the effect of saving hundreds of pounds annually. He was "rewarded" with a sum of twenty shillings. This is cited as an example. It is suggested that when an idea is the outcome of a man working on his own job, this is not more than should be expected; this would be to display ordinary skill but, when ideas emanate from the man's brain which are not in his power to put into effect, these, if accepted, should be paid for on the basis of their intrinsic value. Then suggestions would be encouraged and skill and knowledge would reap their own reward. In the case in point, the man's job rate should not be reduced or he should be given an appropriate lump sum.

P. J. Edward
Hykeham, England

•

WHOSE BUSINESS?

EVERYBODY'S business, from the Old Man to the worker and shop sweeper, is to see and to know what is going on in a manufacturing place. Yes, friend Al, you should be happy if the Old Man landed a thumping big order today, and you should surely tell the boys about it. It is for them to be happy just as well that they will have six months' work, if they want to work.

As far as a raise is concerned, if any man makes a living and gets the standard wage or wages as good as they pay in the other places in the community, and the working conditions are as equal, Ed don't have to worry that the men will ask for a raise if a nice order is received, unless the men are not trained right and do not know what is going on in the job. If they were treated as it was 20 or 30 years back in the sweat shops, then I would not blame them if they hollered for a raise and got it, too.

My dear Ed, if I should be working under you and under your leadership, I would work only when you are around. Nowadays, although we take pride in our job and we like to give a day's work for our money we earn, we also like to feel that we are

KUX

EXPERTS AT

CAM

CUTTING and GRINDING

The largest, most completely equipped plant in the country devoted to CAM cutting and grinding is at your service. 25 YEARS of experience in making special cams for thousands of companies has made us experts at cam cutting and grinding. Our facilities and equipment, finest in the country, permit us to manufacture any style or size Cam, Geneva Motion or Scroll Plate in quantities of 1, 10 or 10,000. Accuracy can be maintained to split thousandths, and surfaces to micro-finishes. Send us specifications or blueprints and we will be glad to submit a detailed quotation on your requirements.

KUX MACHINE COMPANY

3924 WEST HARRISON STREET • CHICAGO 24, ILLINOIS

THE TOUGHER THE CUTTING JOB . . .

..THE BETTER THE OPPORTUNITY FOR

abrasive cutting

This is *one* job outside the sphere of abrasive cutting . . . but . . .

Allison wheels *will* cut accurately and fast . . . through the toughest materials . . . with little or no need for after-finishing.

Call an Allison Abrasive Cutting Expert! As specialists in this specific field, our men are well qualified to recommend the right wheel and best equipment to help you reduce costs on your cutting operations.

We like tough jobs

. . . consult us about yours!

THE ALLISON COMPANY

257 Island Brook Ave.

Bridgeport 8, Conn.

Allison

ABRASIVE CUTTING WHEELS

CUSTOM MADE
at NO EXTRA CHARGE

Jarvis
TECNI-TAPS

JARVIS POWER TOOLS
TAPPING ATTACHMENTS
TECNI-TAPS
ROTARY FILES
FLEXIBLE SHAFTS and
QUICK CHANGE CHUCKS and COLLETS

THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

part of the organization, that the Old Man can't do anything without us, but at the same time that we can't have any work without him. His job is to go out and bring in the work and it is up to us to do it. We must have machinery and tools and material to do the job and if we have the most up-to-date machinery we can do an up-to-date job to compete with other up-to-date concerns.

Wake up, friend Ed. Look around and change the machinery that are of the age of the Model T Ford. Get up-to-date machines and get your boys together and show them the machinery, show them how to operate them to give you up-to-date production, show them the production costs that have to be met if they want to have a job. Let them work with you, not for you, to meet the cost and to cut it; that is, to cut the production cost, to cut scrap, to save on tools and material, and to give a very good job so that no rejections should come back so the Old Man should be able to meet competition and make a little more than he thought he would. Then they will get a bonus as a nice Christmas present. Then and only then will you be able to understand Al's way of being a leader in your department and a good foreman.

The Old Man should go down and tell the boys about the order and what he had to do to get it. Let the men know what everyone is up to now, what keen competition is, what must be done to meet it, and ask for cooperation of the men.

Michael Axler
New York

WHAT'S NEWS

WITH REGARD to whether plant magazines are of real value in any way at all, from boosting or selling the company to the employees or, on the other hand, boosting their morale or in any way contributing to good employe relations, we are doubtful, based on taking an active part in starting two plant magazines in widely separated plants.

On the first occasion in Britain we started one in a plant of approximately 6000 employes. The plant was very busy and was known as a good place to work. There were all kinds of sporting activities: soccer, cricket, fishing, bowling, etc., so lots of news from all these activitjes helped to fill the columns of the magazine quite apart from any shop news contributed by foremen. The company was exclusively engaged on government contracts, and of course made

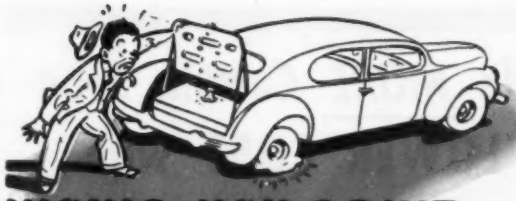
3 Ways to Shrink your biggest production expense

1. ***Be sure to visit the Materials Handling Show in Chicago,*** April 30 - May 4. (Conservative estimates indicate materials handling often represents one-third of metalworking production costs, and you'll find many machines on display that can shrink these costs for you.)

2. ***Visit the American Machinist staff in Booth 448.*** (We'll have copies of our "Show-in-Print" Special Report on hand. You will find it a big help in making sure you budget your show time efficiently. Our staff will also welcome a chance to discuss materials handling problems and opportunities with you.)

3. ***Get the best and latest materials handling ideas regularly in American Machinist.*** (Metalworking men have long found *American Machinist* a far-sighted, alert guide to the best in modern materials handling equipment and techniques.)

American Machinist



WOULD YOU DRIVE WITHOUT A *Spare?*

"Just my luck! A flat tire and no spare! What a predicament!" A machine shop foreman may be in a worse predicament without a spare arbor. When an arbor breaks, production ceases until the arbor is replaced. Machine and manpower hours wasted! Schedules disrupted! Deliveries delayed! That's why we say —

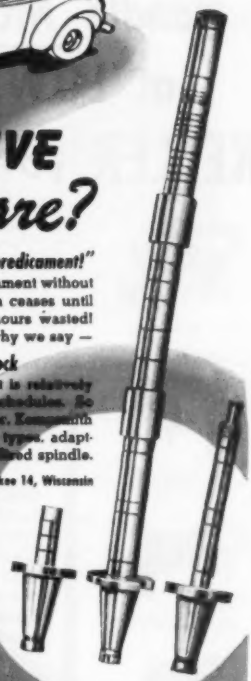
It Pays to Have Several Arbors in Stock

Arbors are "perishable tools" and today their cost is relatively small in comparison to lost hours and disrupted schedules. So play safe! Order your spare arbors today. Remember, Kempsmith Arbors are now available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.

THE KEMPSMITH MACHINE CO. • 1823 L. 71st Street • Milwaukee 14, Wisconsin

Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.



Arbors BY

KEMPSMITH

• Precision Built Milling Machines Since 1888 •

Contact Your Local KEMPSMITH Dealer When in Need of Milling Machines, Attachments, Arbors and Accessories

A 4594-IPCA-R

From the *American Machinist* Library of *Tips for Top Shop Men*

ONLY two of your possessions increase in value proportionally with price inflation. One is time, the other knowledge. You can employ both productively to build security, or squander them.

MICROSTRUCTURE, rather than composition, may frequently be the key to successful machining of a part. Two pieces that look alike and were made alike may be entirely different in their reaction to a tool.

Handle MORE Cutting Jobs at LOWER COST with KELLER POWER HACK SAWS

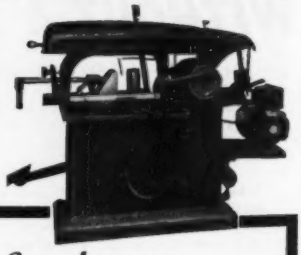
No. 1 Bench Model

No. 3C Wet Cut with Automatic Lift

No. 1 Bench Model with Automatic Lift

No. 1 Floor Model with Automatic Lift

The No. 3 Hy-Duty Keller Power Hack Saw has patented adjustable blade control for faster cutting and longer blade life.



THE *Complete* LINE

QUICK SELECTION of the right KELLER Power Hack Saw is easy. There is a low priced model for every cutting requirement. Keller Saws will handle all cutting jobs from heavy bars to thin wall tubing. FAST CUTTING . . . you get the job done quickly and at low cost. Hack saw blades last longer too! KELLER Hack Saw design is modern . . . simple to operate. Sturdy construction provides long operation with minimum maintenance.

YOUR BEST INVESTMENT is a KELLER Power Hack Saw.

Let us tell you more about a model that will make money for you!

No. 3B Dry Cut with Automatic Lift

No. 1 Floor Model

No. 3A Dry Cut

MAIL THIS COUPON TODAY

SHOW ME . . . All the models of Keller Power Hack Saws. Send me your new catalog by return mail.

NAME ..... COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

Sales Service Machine Tool Co.

PRESS RITE PRESSES · SHAPE RITE SHAPERS · KELLER POWER HACK SAWS

2347 UNIVERSITY AVENUE
ST. PAUL 4, MINNESOTA

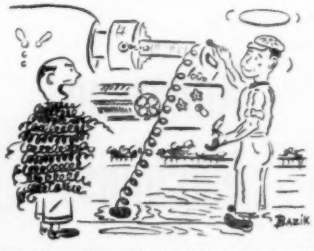
good profits. If such had not been the case I don't believe that the plant magazine would have lasted as long as it did, due to the tremendous lot of time that was spent by a couple of fellows whose sole job it was to edit and correct the news sent in. Also the fellows in the shop would stop their machines and read anything that interested them, and then often throw them around the shop.

Some time later came the slump. Hundreds were laid off. About the same time a notice appeared on the bulletin board saying that due partly to lack of business the plant magazine would be discontinued temporarily. When better times came it would be resumed. A few years later the plant was enlarged and busier than before, but the plant magazine was never issued again, and very few indeed really wanted it.

No matter who writes plugs for the plant magazine, unless plant conditions — wages, supervision — are such as to maintain the reputation of being a good place to work, all the plugging that could be printed would be of no avail. On the other hand, if it is a good place to work, it doesn't need any plugging in a works magazine.

In my opinion, plant magazines are useless, unnecessary and certainly cost a lot of money, time and labor to produce, and of course must add to the cost of the product being made. Lots of manufacturers are currently stating that employees are not getting the greatest output that is possible from the new machines, the latest in tools and equipment. They are quite right. There are too many diversions to take the employees' minds off production, some of them installed by employers themselves. It is well to remember that the working week has been reduced and every minute counts. Why add to lost production time by adding a plant magazine further to reduce production as it very definitely does.

Arthur Silvester
Niantic, Conn.



"You know darn well what hole in the floor!"

DRESS COMPLEX FORMS
in one continuous motion with J & S "Fluidmotion" DRESSERS!

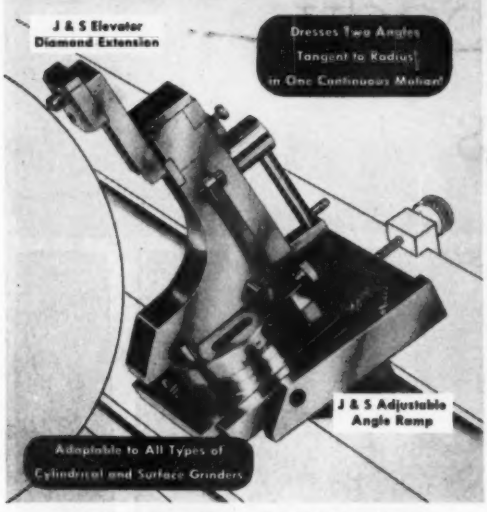

J & S Elevator Diamond Extension
Dresses Two Angles Tangent to Radius in One Continuous Motion!
J & S Adjustable Angle Ramp
Adaptable to All Types of Cylindrical and Surface Grinders

Photo shows how the standard J & S Model "E" Dresser is applied to cylindrical grinder with inclined table, wheel over 14" dia. Two standard J & S attachments (shown above) easily adapt dressers to all grinders. Also, by inverting diamond extension, you can dress ¼" dia. mounted wheels for internal grinding.

You can easily increase production rates of your grinding machines by reducing time-off for form-dressing. For **fastest possible** dressing, J & S "Fluidmotion" Dressers are the answer. With "Fluidmotion", only **one setting** is necessary for **dressing two angles tangent to a radius—using one handle in one continuous motion.**

Resulting forms are clean, precise—angles and radii flow into each other. On high production set-ups, sharp contours **without tool or chatter marks** are consistent to .0001" accuracy.

With today's tight supply of experienced machinists—and ever-increasing demand for faster production—it will pay you to investigate J & S "Fluidmotion" Dressers. They are the simplest, fastest dressers you can buy—**even beginners can use them** to boost production rates of your cylindrical and surface grinders. Write for DRESSER CATALOG.

J & S "Fluidmotion" Dressers are one of the popular J & S "Machine Shop TIME SAVERS". ("Time Saver" booklet, describing J & S "Fluidmotion" Wheel Dressers, etc., sent on request.)

*Reg. U.S. Pat. Off.

J&S TOOL CO., INC.
473 Main Street, East Orange, N. J.
Representatives in Principal Cities

GRIPCO LOCK NUTS

PUSH PRODUCTION UP

Made to lock on bolts of varying tolerances —start on the Bolt easy, just like a common

nut. When the "double triangle" deflected Nut Threads (patented) engage the Bolt Threads, they make a secure "union", a "couple" that can only be "divorced" by a "wrench".

Locks wherever it stops. Its sustained holding power is unaffected by vibration, oil, water or chemicals. Can be removed and reapplied many times without appreciable loss of locking efficiency. *Available in Steel or Brass.* Made to fit National fine or National coarse thread bolts.

PUSH COSTS DOWN

GRIPCO PILOT-PROJECTION
WELD NUTS

Save time and trouble. The circular Pilot centers the Gripco Weld Nut instantly, right over the bolt hole, for quick, accurate welding. No measuring. No jigs. No time wasted. Gripco Weld Nuts are available with standard threads or with Gripco Lock threads, and with two Pilot heights to fit different thicknesses of metal.

Samples and prices on both *Gripco Lock Nuts* and *Gripco Pilot-Projection Weld Nuts* will be sent promptly on request. Specify type of thread as well as sizes of nuts.

GRIP NUT COMPANY
310-C SO. MICHIGAN AVE., CHICAGO 4, ILL.

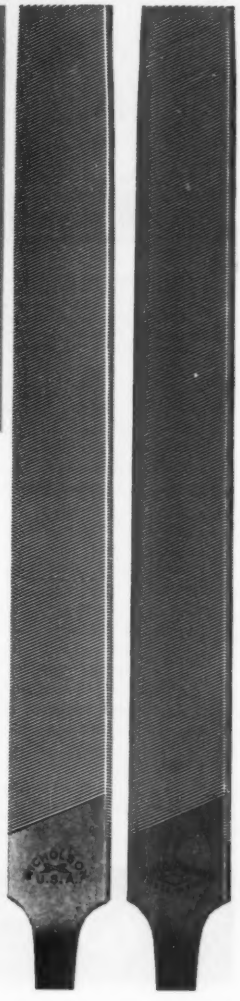
R-5354

NICHOLSON U.S.A. TRADE MARK

BLACK DIAMOND TRADE MARK

The trademarks everybody knows

The files everybody likes



THAT'S a short way of saying that, through outstanding quality, unsurpassed value, and wide variety, Nicholson and Black Diamond brands constitute the most extensively used files in the world. They're the leading choice among industrial concerns, expert mechanics, tool, die, instrument and model makers, and others whose experience has afforded opportunities for comparisons.

You can't always *see* the differences in files, but *use* usually brings them out in unmistakable degree.

The sweeping Nicholson guarantee of *Twelve perfect files in every dozen* carries the assurance that, within practical requirements, each file is *properly shaped and balanced, accurately cut, evenly hardened,* and made of the *finest steel* obtainable for the purpose.

Sold through leading industrial distributors.

FREE BOOK, "FILE FILOSOPHY." Especially helpful to production heads, purchasing agents, master mechanics. Write for the number of copies you need for keymen distribution.

NICHOLSON FILE CO. • 29 ACORN STREET • PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON FILES
. . . A FILE FOR EVERY PURPOSE

subcontracting NEWS

POTENTIAL SUBCONTRACTORS who have the know-how and facilities to work on the great variety of jobs let by the Detroit Ordnance district can get some idea of the work required by looking at the exhibit maintained at Detroit Arsenal, Centerline, Mich.

Chrysler's Subcontracting Methods Described for Small Manufacturers

DETROIT—How does a small business firm go about securing subcontracting work from a prime defense contractor? What are the requirements the firm must meet?

Answers to these useful questions were spelled out in detail by W. F. Beckley of the Chrysler Corp. purchasing dept., in a recent talk before the Michigan Commercial Secretaries' Assn. here. In describing Chrysler's methods of subcontracting, Beckley drew a parallel with other large prime contractors. He cited Chrysler's last-war record on subcontracting to underscore current need for small-shop aid in delivering defense goods; in prewar days, Chrysler used about 1500 outside suppliers of parts and sub-assemblies. During the war this number leaped ten-fold, to 15,000 suppliers.

• **How does a firm secure** a subcontract? Beckley recommends these steps:

(1) Self-analyze your facilities; find what products they are best qualified to make for defense.

(2) Decide what you want to make.

(3) Prepare a document about your company. Give information on financial standing, equipment and machinery types and amount, personnel. List items you have been making and those you prefer to make for defense.

(4) Seek out the prime contractors who might have need of your facilities and preferred products. Don't scatter your contacts with any and all firms. Concentrate on those most likely to hire your facilities.

(5) Go to the prime contractor and sell him on what you can do, preferably by personal call. This is a sales problem essentially.

Tank Program Buyer Named

FLINT MICH.—Fisher Body Division has appointed officials in charge of large recently-obtained defense assignments. E. S. Howell was named buyer in charge of purchasing for the tank plant which Fisher will operate at Grand Blanc (Flint). Howell was a buyer for the tank plant when Fisher operated it during World War II. The contract for the job totals $195 million; substantial subcontracting is anticipated.

Extensive Subcontracting For K-F Cargo Plane Job

WILLOW RUN—Kaiser-Frazer production of C-119 Fairchild Cargo Carriers for the Air Force will call for large-scale subcontracting. K-F is currently tooling up about one-third of Willow Run for airplane mass production. At the same time, new and "demoth-balled" equipment is being delivered to major subcontractors, who will supply approximately 35% of the major sections for final C-119 fabrication.

Some of K-F's C-119 program suppliers: Murray Body Corp., Detroit—will build conical booms, dorsal fins and doors; Gibson Refrigerator Co., Greenville, Mich.—cargo floors, ailerons, others; Whirlpool Corp., St. Joseph, Mich.—wings, wing tips and outboard flaps; Willys-Overland—all landing gear.

Most of these K-F suppliers are expected to "farm out" work to additional subcontractors.

Ford Contract Increased

CHICAGO—The original Ford Motor Co. contract with the Air Force for manufacture of Pratt & Whitney aircraft engines has been increased to an estimated total value of $565 million, about ten times the original contract.

Ford is negotiating with large and small subcontractors to provide many of the 20,000 parts in the P&W engines. Orders have already been placed with 2211 suppliers, according to Maynard T. Murray, general manager of the Ford aircraft engine division.

Tank Contracts Announced

CLEVELAND — Apex Electric & Mfg. Co. has obtained Army Ordnance contracts from five manufacturers to make intricate electronic assemblies for tanks, including firing mechanisms, tank generators, tank starters, and for the elevation and traversing mechanism for airborne guns. The contracts total several million dollars.

Latest Defense Contracts . . .

WASHINGTON — Here follows the latest list of defense contracts awarded by armed services procurement agencies. For security reasons, dollar values and quantities are no longer being released by the Department of Defense.

ARMY AWARDS

Ordnance Tank Automotive Center, 1501 Beard St., Detroit

Studs—Electric Autolite Co., Toledo.
Discs—Motor Wheel Corp., Lansing, Mich.
Automobiles — Chevrolet Motor Div., Detroit; Ford Motor Co., Detroit.
Retainers — Bendix Westinghouse Automotive Air Brake Co., Elyria, Ohio.
Ignition coils—P&D Mfg. Co., Long Island City, N. Y.
Armature, coil—General Armature & Mfg. Co., Lock Haven, Pa.
Switch, instrument — Zaiger Corp., Lynn, Mass.
Plugs—K-D Lamp Co., Cincinnati.
Pistons — Triplex Corp of America, Pueblo, Colo.
Starter, shaft, etc. — United Motors Service Div., General Motors Corp., Detroit.
Magneto, engine assembly — Tunick Brothers, Stamford, Conn.
Gage, conduit, etc.—Food Machinery & Chemical Corp., San Jose, Calif.
Kit, shaft — Bendix Products Div., Bendix Aviation Corp., South Bend, Ind.
Magneto, engine left—American Bosch Corp., Springfield, Mass.

$37 Million in Ordnance Contracts for Buses

DETROIT—The Ordnance Tank Automotive Center here has awarded contracts for buses amounting to almost $37 million. Twin Coach Co., Kent, Ohio, got a contract for $19,617,000 to build 1650 buses; GMC Truck & Coach Div. at Pontiac, Mich., has a bus contract for $11,554,200; and ACF Brill Motors Co., Philadelphia, will build 435 buses under a $5,750,265 contract.

Other major awards: Reo Motors Corp., Lansing, Mich., 3984 trucks, $14,770,000, and dump trucks, $3,730,508; Union Steel Castings Div., Blaw-Knox Co., Pittsburgh, cast steel armor, $1,300,000.

Machine, milling—The Chas. A. Strelinger Co., Detroit.
Machine, milling light — Brown & Sharpe Mfg. Co., Providence, R. I.
Nut, lock, wheel—Standard Locknut & Lockwasher, Inc., Indianapolis.
Steel, sheet—United States Steel Co., —Detroit.
Plate—Spicer Mfg. Div. of Dana Corp., Toledo.
Absorber, shock, ass'y—Monroe Auto Equipment Co., Monroe, Mich.
Hoist, electric—Whiting Corp., Harvey, Ill.
Compressor, air — American Brake Shoe Co., Kellogg Div., Rochester, N. Y.
Truck, dump—Reo Motor Inc., Lansing, Mich.
Crankshaft & par oil engine ass'y—Motive Parts Co. of America, Inc., Chicago.
Cable, towing, steel dia — American Chain & Cable Co., Inc., Wilkes-Barre, Pa.
Cable, towing, steel dia — John A. Roebling's Sons Co., Trenton, N. J.
Chain tow, 16 ft—The McKay Co., Pittsburgh.
Chain tow, with grab hook and clevis —Campbell Chain Co., York, Pa.
Kit, repair — Bendix Products Div., South Bend, Ind.
Arm, spacer, cover, cage, elbow, etc. — Kenworth Motor Truck Corp., Seattle.
Horn, ass'y—E. A. Laboratories, Inc., Brooklyn, N. Y.
Manifold, exhaust ass'y for gas engine —Kay Industries, Inc., Detroit.
Box, master junction & spare parts—Eclipse - Pioneer Div., Teterboro, N. J.
Steel, free cutting, screw stock—Columbia Steel & Shafting Co., Pittsburgh.
Bolt, bogie top roller—Sav-Way Sara Seal, Inc., Detroit.
Valve, relief, torque converter pressure, valve, relief transmission—The Fulflo Specialties Co., Inc., Blanchester, Ohio.
Lift—Walker Mfg. Co. of Wisconsin, Racine.
Differential—Ward LaFrance Truck Corp., Elmira, N. Y.
Piston, engine, plugs & rings—United Engine & Machine Co., San Leandro, Cal.
Cover, cal. 50 machine gun mounting —Mackenzie Awning Co., Detroit.
Bearing, ball — Harold Benedict Co., Detroit.
Bearing, ball—Bearings Co. of America, Lancaster, Pa.
Motor, roof, fan, kit, differential gear —Chrysler Corp., Detroit.
Pistons, w/rings w/o pin—United Engine & Machine Co., San Leandro, Cal.
Wheel disc w/ring ass'y nut adjusting wheel bearing dowel ass'y — The Budd Co., Detroit.
Hub, rear wheel w/cup ass'y—Federal Motor Truck Co., Detroit.
Generator—Hurz & Root Co., Appleton, Wis.

Picatinny Arsenal, Dover, N. J.

Projectile, M99, 20mm, metal parts assembly—G. M. Mfg. Co., Inc., Long Island City, N. Y.
Primer, percussion, metal parts—Eagle Lock Co., Terryville, Conn.

Frankford Arsenal, Philadelphia

Range finder—Bausch & Lomb Optical Co., Rochester, N. Y.
Instrument lights, cover assembly & special tooling—A. C. Gilbert Co., New Haven, Conn.
Funnel blanks—Wolverine Tube Div., Calumet & Hecla Consolidated Copper Co., Inc., Detroit.
Prism, 90 deg.—Edmund Salvage Co., Barrington, N. J.
Tracer bullet charging machine, cal. .50—Waterbury Farrel Fdry & Mach. Co., Waterbury, Conn.
Front sight M26 and special class "A" tooling—Ansco Div., General Aniline Film Corp., Binghamton, N. Y.
Knob, brass, forging, mech. ass'y, pin eccentric ring, retain tube level washer ass'y, worm Level—Permutit Co., New York.
Range finder—Chrysler Corp., Detroit.

Corps of Engineers, Chicago Procurement Office, 226 West Jackson Boulevard

Truck, fire—Central Fire Truck Corp., St. Louis, Mo.
Truck, fire — Minnesota Fire Equipment Co., Lindstrom, Minn.
Truck, fire—Howe Fire Equip. Co., Anderson, Ind.
P/F universal engine—Universal Motor Co., Oshkosh, Wis.
Cranes—Hyster Co., Portland, Ore.
Trailers—Trailmobile Co., Cincinnati.
Trailers—Hobbs Mfg. Co., Ft. Worth, Tex.
Cranes—Bay City Shovel Co., Bay City, Mich.
Road rollers—Buffalo Springfield Roller, Springfield, Ohio.
Spare parts—Erie Steel Construction Co., Erie, Pa.

Signal Corps Procurement Agency, 2800 S. 20th St., Philadelphia

Reperforator sets—J. H. Hunnell & Co., Brooklyn, N. Y.; Haspeth Telephone & Radio Corp., Brooklyn, N. Y.
Auxiliary interphone equipment, and maintenance parts — Alliance Mfg. Co., Alliance, Ohio; Telectro Industries Corp., Long Island City, N. Y.; Automatic Radio Mfg. Co., New York.
Signal generators, maintenance parts —Harvey-Wells Electronics, Southbridge, Mass.
Electron tubes — General Electronics, Inc., Paterson, N. J.
Radio sets, maintenance parts—Hoffman Radio Corp., Los Angeles; Hallicrafters Co., Chicago; Collins Radio Corp., Cedar Rapids, Iowa.
Radio transmitter sets — Transmitter Equipment Mfg. Co., New York.

(*Continued on page 184*)

Eyelets?
Eyelet machine products?

Here, illustrated full size, are some examples of the parts we make—in a wide variety of metals and finishes. Some are of simple design . . . others are intricate, precision-made parts for industrial, electrical and scientific purposes.

We'll be glad to quote on your requirements, and have thousands of stock tools which may save tooling-up charges. Just send us a sample, drawing or description, together with quantity and other pertinent information.

THE AMERICAN BRASS COMPANY,
Dept. WBG, Waterbury 20, Connecticut. S1249

for eyelet machine products
it's **ANACONDA**

COPPER • BRASS • BRONZE • NICKEL SILVER
NICKEL • IRON • STEEL • STAINLESS • ALUMINUM

SIGNAL CORPS AWARDS ... continued

Radio terminal sets—Hallicrafter Co., Chicago; Espey Mfg. Co., New York.
Power units—Kehler Co., Kohler, Wis.; Universal Motor Co., Cahkosh, Wis.; United States Motors Corp., Cahkosh, Wis.
Trucks, 2½ ton, maintenance & telephone construction—J. M. Holden Corp., Cleveland; McCabe Powers Auto, St. Louis.

AIR FORCE AWARDS

Air Materiel Command, Wright Paterson AF Base, Dayton, Ohio

Transmitters — Eclipse-Pioneer Div., Bendix Aviation Corp., Teterboro, N. J.
Indicators — Eclipse Pioneer Div., Teterboro, N. J.
Airspeed indicator—U.S. Gauge Div., American Machine & Metals, Inc., Sellersville, Pa.
Temperature indicators—Weston Electrical Instrument Corp., Newark, N. J.
Cutaway government furnished engine trainers — United Aircraft Corp.; Pratt & Whitney Aircraft Div., East Hartford, Conn.
Telephone central group spare parts and engineering data for radar set —Connecticut Telephone & Electric Corp., Meriden, Conn.
Overhaul conversion and modernization of aircraft engines — Wright Aeronautical Corp., Curtiss Wright Corp., Woodridge, N. J.
Rebuilding of aircraft, North American Aviation, Los Angeles.
Spare parts for aerial targets—Radioplane Co., Van Nuys, Cal.
Miscellaneous tools for overhaul of engines—General Electric Co., West Lynn, Mass.
Spare parts for jet engines—Allison Div., General Motors Corp., Indianapolis.
Spare parts for components of compass system — Sperry Gyroscope Co., Sperry Corp., Great Neck, N. Y.
Spare parts for wheel and brake assemblies—Goodyear Tire & Rubber Co., Inc., Akron, Ohio.
Generators — General Electric Co., Schenectady, N. Y.
Power units — Sorensen & Co., Inc., Stamford, Conn.
Vertical gyro indicator and vertical gyro control—Bill Jack Scientific Instrument Co., Solano Beach, Cal.
Flight computer system—Sperry Gyroscope Co., Great Neck, L. I., N. Y.
Press and rolling welders—National Electric Welding Machine Co., Bay City, Mich.
Chucking machine — National Acme Co., Cleveland, Ohio.
Wheel and brake assembly—Bendix Products Div., Bendix Aviation Corp., South Bend, Indiana.
Wheel and brake assembly — B. F. Goodrich Co., Akron, Ohio.
Generators—Jack & Heintz Precision Industries, Inc., Cleveland.
Air compressors—Cornelius Co., New Brighton, Minn.
Valves and spare parts for fuel systems on aircraft—Adel Div., General Metals Corp., Burbank, Cal.
Inverters—Royal Electric, Inc., Jamestown, Ohio.
Starters—Jack & Heintz Prec. Industries, Inc., Cleveland.
Modification parts for engines—Allison Div., General Motors Corp., Indianapolis.
Aircraft spare parts, special tools and ground handling equipment—Consolidated Vultee Aircraft, San Diego.
Aircraft—Boeing Airplane Co., Seattle, Washington.
Milling machine—Weisner Rapp Co., Inc., Buffalo, N. Y.
Brake, sheet metal—Airtherm Mfg. Co., St. Louis, Mo.
Power presses—E. W. Bliss Co., Canton, Ohio.
Special maintenance tools — B. K. Sweeney Mfg. Co., Denver, Colo.
Cleveland trim press—Cleveland Punch & Shear Works Co., Cleveland.
Cut master vertical turret lathe—Bullard Co., Bridgeport, Conn.
Cam pneumatic rotating chucking machine — New Britain-Gridley Machine Co., New Britain, Conn.
Aircraft camera — Polaroid Corp., Cambridge, Mass.
Large precision castings for aircraft components—Alloy Engineering & Casting Co., Champaign, Ill.
Diesel generator sets—Detroit Diesel Engine, Div. of General Motors Corp., Detroit.
Type double end heald borematic—Heald Machine Co., Worcester, Mass.
Aerial cameras—Fairchild Camera & Instrument Corp., Jamaica, N. Y.
Miscellaneous aerial photographic equipment—Fairchild Camera & Instrument Corp., Jamaica, N. Y.
Bryant precision hydraulic hole and external or face grinder — Bryant Chucking Grinder Co., Springfield, Vermont.

(Continued on page 188)

Firms Get Plant Expansion Aid

WASHINGTON—Following is a list of certificates of necessity granted by the Defense Production Administration to metalworking firms during the period Jan. 25 to March 7.

Fast amortization of part of the costs of these plant expansions were granted to a total (not exclusively metalworking) of 231 companies for 313 projects. Total cost of the expansions involved is $1.1 billion; the average percentage of the cost which may be written off in 5 years is 74%.

(Information in list below follows this order: name of company, location of facilities, the product or use, and amount certified.)

Atwood-Vacuum Machine Co., Rockford, Ill., aircraft parts, $1,500,000.

Heintz Mfg. Co., Philadephia, aircraft parts, $694,800.

Burgess Norton Mfg. Co., Geneva, Ill., tank parts, $692,975; tank truck bodies, $157,600.

Marvel Schebler Products Div., Borg-Warner Co., Decatur, Ill., aircraft parts, $796,112.

Pesco Products Div., Borg-Warner Co., Redford, Ohio, aircraft accessories, $996,078.

Boeing Aircraft Co., Seattle, engineering aircraft production, $1,405,000.

Marlin Rockwell Corp., Plainville, Conn., aircraft parts, $1,104,695.

Nordberg Mfg. Co., Milwaukee, diesel engines, $3,694,409; diesel engine components, $1,076,887.

Weatherhead Co., Antwerp, Ohio, aircraft hose, assemblies, $816,410.

Air Research Mfg. Co. of Arizona, Phoenix, aircraft parts, $1,959,728.

Air Research Mfg. Co., Div. of Garrett Corp., Los Angeles, aircraft parts, $608,777.

Pueblo Steel Corp., Pueblo, Colo., seamless and merchant pipe, $80,000,000.

Lapointe Machine Tool, Hudson, Mass., broaching machine tools, $1,399,064.

Olin Industries, Inc., New Britain, Conn., ordnance material, $1,015,315; East Alton, Ill., ordnance supplies, $1,015,315.

J. K. Holan Corp., Cleveland, special truck bodies for public utility companies, $643,388.

Vanadium Corp. of America, Nigeria, N. Y., ferro chromium, $1,160,639.

Cleveland Graphite Bronze Co., Cleveland, aircraft parts $561,699.

Allis Chalmers Mfg. Co., LaPorte, Ind., cargo tractors (ordnance), $2,576,000.

Hotpoint, Inc., Milwaukee, aircraft parts, $1,913,000.

Northrop Aviation, Inc., Hawthorne, Calif., aircraft, $2,046,100.

Cincinnati Milling Machine Co., Cincinnati, milling machines, lathes, $4,156,958; abrasive grinding wheels, $374,040; at Wilmington, Ohio, machine tools, $3,472,600.

Consolidated-Vultee Aircraft Corp., Pasadena, Calif., wind tunnel testing, $3,985,007; at San Diego, airplanes, $139,600, and airplane parts, $1,511,838.

Wright Aeronautical Corp., Caldwell, N. J., aircraft parts, $578,600; at Woodridge, N. J., aircraft parts, $5,334,440; at Garfield, N. J., aircraft parts, $6,124,000.

General Electric Co., East Hartford, N. Y., electronic equipment, $15,693,000; at Owensboro, Ky., electronic tubes, $336,306; at Lockland, Ohio, aircraft parts, $25,695,911; at Lynn, Mass., aircraft parts, $4,037,024; at Everett, Mass., aircraft parts, $647,689.

Goodyear Tire & Rubber Co., Inc., Muncie, Ind., tank tracks, $398,698; at Akron, Ohio, tank bogie wheels & rollers, $322,855.

Stewart-Warner Corp., Chicago, ordnance supplies, $503,461.

Firth Sterling Steel & Carbide Co., McKeesport, Pa., metal cutting tools, $219,956.

New Britain Machine Co., New Britain, Conn., bolts and nuts, $737,159.

Cincinnati Gear Co., Cincinnati, gears, $236,643.

Timken-Detroit Axle Co., South Central, Ohio, axle transfer cases & parts, $15,650,000.

Screw Products of America, Los Angeles, self-locking nuts, $1,575,709.

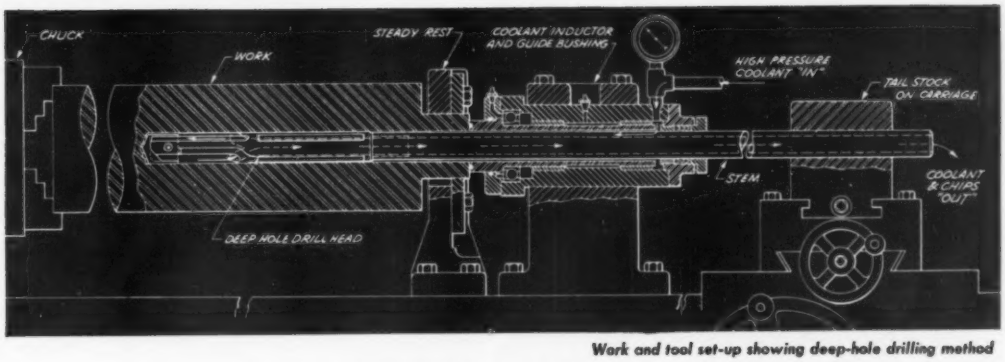
International Business Machines Corp., Poughkeepsie, N. Y., ordnance supplies, $17,910,000.

Cupples Products Corp., Maplewood, Mo., alloy aluminum extrusions, $881,798.

Eaton Mfg. Co., Cleveland, compressor blades for aircraft, $850,000.

Fairchild Camera & Instrument Co., Long Island, N. Y., aerial photographic equipment, $4,395,292.

Ladish Corp., Cudahy, Wis., steel forgings, $3,757,452.



Work and tool set-up showing deep-hole drilling method

Conner Guided Deep-Hole Drill for extremely deep holes

DEEP HOLE ENGINEERING

Now is the Time!

Today many manufacturers are faced with new and often perplexing problems of production machining unfamiliar to the operating personnel of their plants.

It may be that deep holes and large diameter holes are called for in tough and hard steels and alloys.

If such is your case, now is the time to employ our services for consultation, preferably when your project is yet in its initial planning stage.

Our services should include relating the requirements of the job to your facilities, and, if warranted, providing you with a formal method study evaluating all possible lines of approach.

Thus, by employing us at a nominal engineering fee, you would arrive at a properly arranged sequence of operations, the correct choice of machines and other facilities, your power requirements, a close estimate of the time the operation will consume, and the tool design best suited to the work.

Many leading manufacturers of armament, machine tools, electrical and oil field equipment are relying on our deep hole engineering service, tool designing, deep hole drills and boring tools.

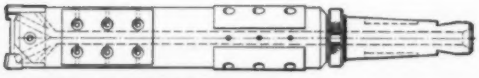
You too will find it profitable to consult us.

CONNER TOOL & CUTTER CO.

1000 East McNichols Road, Detroit 3, Michigan

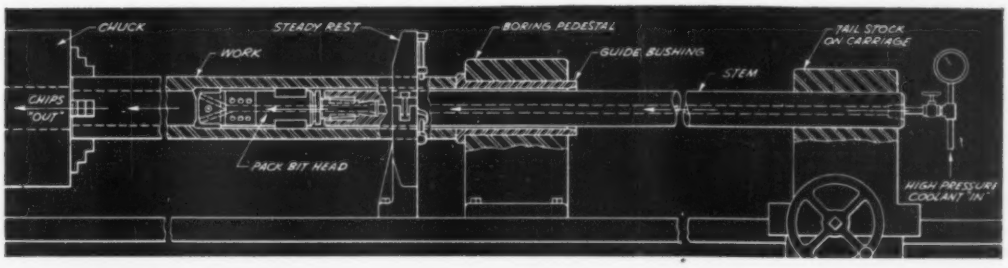
CONSULTANTS • DESIGNERS • TOOL MAKERS • DRILLERS

Deep Holes Exclusively



Conner Pack Bit Boring Head

Below: Set-up for boring deep holes with Pack Bit Boring Head



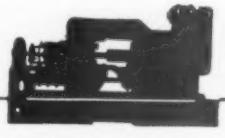
TOOLING, TOLERANCES, TIMES . . . all on tap for you!

If you're interested in rearmament orders for parts like these, we can help you.

National Acme Tool engineers began, months ago, to think out—*and prove out*—the best methods for quick, automatic production of these orders.

This action has short-circuited the need for educational orders, trial setups, experimental tooling and other time-consuming, profit-losing preliminary steps in your plant. You're ready to go—*now*—with tested, standardized tooling and established methods, proved by millions of parts already turned out on Acme-Gridley Bar Automatics.

Use this ready-made experience—put the job on Acme-Gridleys and benefit by our knowledge of the tooling, tolerances and times required. Our engineering experts will be glad to help you swing into action for quick rearmament production on your present Acme-Gridleys.

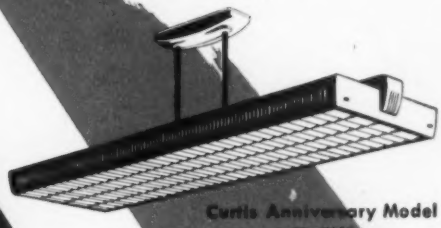


THE NATIONAL ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

No other source offers a line so COMPLETE—so much design and tooling EXPERIENCE in Multiple and Single Spindle Bar and Chucking Automatics.

Light Production Costs on Heavy Volume of Light Fixtures



Curtis Anniversary Model 51-CLH

At Curtis Lighting, Inc., Chicago, this 250-ton Clearing press produces louvers up to four feet long for fluorescent lighting fixtures. It hasn't been out of service a single minute in three years of steady two-shift operation. With two men working the three station dies, the press blanks, perforates and forms 68 complete louvers per hour.

Steady, top tempo production without interruption is the secret of real economy, and Curtis Lighting, Inc., chose Clearing because they knew it was the way to hold down costs. With something like 12,000 service hours delivered and the first minute of press down-time still uncharged, it seems they made a wise choice.

If you want that kind of production economy in your plant, get in touch with Clearing.

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

CMC CLEARING

CLEARING PRESSES

THE WAY TO EFFICIENT MASS PRODUCTION

AIR FORCE AWARDS ... continued

Magnetic inspection machine—Magnaflux Corp., Chicago.
Low carbon low alloy steel sheet—Armco Steel Co., Middletown, Ohio.
Plain type horizontal — Kearney & Trecker Corp., Milwaukee.
Spindle automatic—Cleveland Automatic Machine Co., Cleveland.
Ajax presses, forging—Ajax Mfg. Co., Cleveland.
Abrasive cut-off machines—American Chain & Cable Co., Bridgeport.
Surface grinder—Gallmeyer & Livingston Co., Grand Rapids, Mich.
Chucking lathes—Gisholt Machine Co., Madison, Wis.
Surface grinders — Brown & Sharpe Mfg. Co., Providence, R. I.
Machine tools — Chambersburgh Engineering Co., Chambersburgh, Pa.
Milling machines—Cincinnati Milling Machine Co., Cincinnati.
Power drills—Leland-Gifford Co., Worcester, Mass.
Gear shapers — Fellows Gear Shaper Co., Springfield, Vt.
Facilities for production of landing gear and struts—A. O. Smith Corp., Milwaukee, Wis.
Facilities for production of aircraft—Douglas Aircraft Co., Inc., Long Beach, Cal.

NAVY AWARDS

U.S. Navy Purchasing Office, Washington 25, D.C.

Stainless steel sheets—Eastern Stainless Steel Corp., Baltimore.
Jacks, roller car type — R. V. Jack Corp., Arcade, N. Y.
Lathes, 11-in. swing, and universal milling machines — Hardinge Brothers, Inc., Elmira, N. Y.
Trucks, industrial platform type, gasoline powered, 2000 & 4000-lb capacity —HH Manufacturers, Long Beach, Calif.
Grinders, portable electric, abrasive wheels, etc.—Bradford Machine Tool Co., Cincinnati.
Trucks, cranes, wheeled, gasoline—Gibson Mfg. Corp., Longmont, Colo.
Jacks, automobile & truck hydraulic—Auto Specialties Mfg. Co., St. Joseph, Mich.
Tools, tube bending — Republic Mfg. Co., Cleveland.

Bureau of Ships, Washington 25, D. C.

Electric winch—Ideal Windlass Co., East Greenwich, R. I.
Electric hoists, winch type — Yale & Towne Mfg., Philadelphia Div.
Radiosonde receptors — Bendix Aviation Corp., Frieze Instrument Div., Baltimore.
Teletype, typing reperforator, send-receive—Teletype Corp., Chicago.
Condensing unit assemblies — Carrier Corp., New York.
Pumps, variable delivery, for aircraft carrier elevators—Vickers, Inc., Detroit.
Control stands, control receiver kits—Allis Chalmers Mfg. Co., Milwaukee.

Ships Parts Control Center, Mechanicsburg, Pa.

Repair parts for underwater log systems—Bendix Aviation Corp., Pacific Div., North Hollywood, Calif.
Repair parts for electrical control equipment, motors and generators —General Electric Co., Philadelphia.
Repair parts for centrifugal pumps—Buffalo Pumps, Inc., Buffalo, N. Y.
Temperature regulators and repair parts—Robertshaw-Fulton Controls Co., Fulton-Sylphon Div., Knoxville, Tenn.
Repair parts for diesel engines—General Motors Corp., Detroit Diesel Engine Div.
Repair parts for electric motors—Century Electric Co., St. Louis.
Repair parts for switchgear equipment —I-T-E Circuit Breaker Co., Philadelphia.
Repair parts for submersible pumps—A.O. Smith Corp., Pacific Coast Works, Los Angeles.
Repair parts for compressors and pumps — Gardner-Denver Co., Quincy, Ill.

Yards & Docks Supply Office, Port Hueneme, Calif.

Bucket, clamshell, crane or crane shovel—Pettibone Mulliken Corp., Chicago.
Bucket, dragline, crane or crane shovel—Drake-Williams Mount Co., Omaha.
Repair parts for Caterpillar tractors—Caterpillar Tractor Co., Peoria, Ill.
Mixer, concrete—Chain Belt Co., Milwaukee.
Leads and adapters, pile driver—Yaun Welding & Dragline Buckets, Inc., Baton Rouge, La.
Tagline winder, crane — McCaffrey Ruddock Tagline Corp., Los Angeles.
Hammer, pile driver, drop, 3000 lb—Clyde Iron Works, Duluth, Minn.
Compressor, air, trailer—LeRoi Co., Milwaukee.

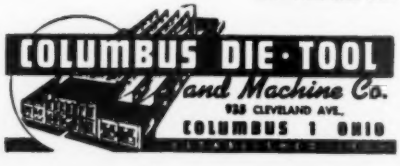
Aviation Supply Office, 700 Robbins Ave., Philadelphia

Pipe, red brass, seamless — Lewin-Mathes Co., St. Louis, Mo.
Batteries, Exide, 200 cells for MMS and necessary electrolate—Electric Storage Battery Co., Philadelphia.
Container assembly, shipping, metal—Southline Metal Products, Houston, Tex.
Strips, commercial brass—Revere Copper & Brass, Inc., Baltimore.
Container assembly, shipping, metal—Metal Industries, Inc., Indianapolis.
Tube assembly, engine mount, for aircraft—Douglas Aircraft Co., Santa Monica, Calif.
Ignition unit for use on J43P6 engines —General Laboratory Associates, Inc., Norwich, N. Y.

ACCURACY
Efficiency
Economy

These three factors are the key-note of our special tools and machinery. Columbus Die-Tool builds and designs the tool for your particular purpose and will solve the toughest tooling problems effectively and promptly. Do not hesitate to consult us, our experience in this field is most comprehensive.

JIGS • FIXTURES • SPECIAL TOOLS
BUILDING COMPLETE MACHINE TOOLS
UNITS FOR MACHINE TOOLS
PUUNCHES AND DIES



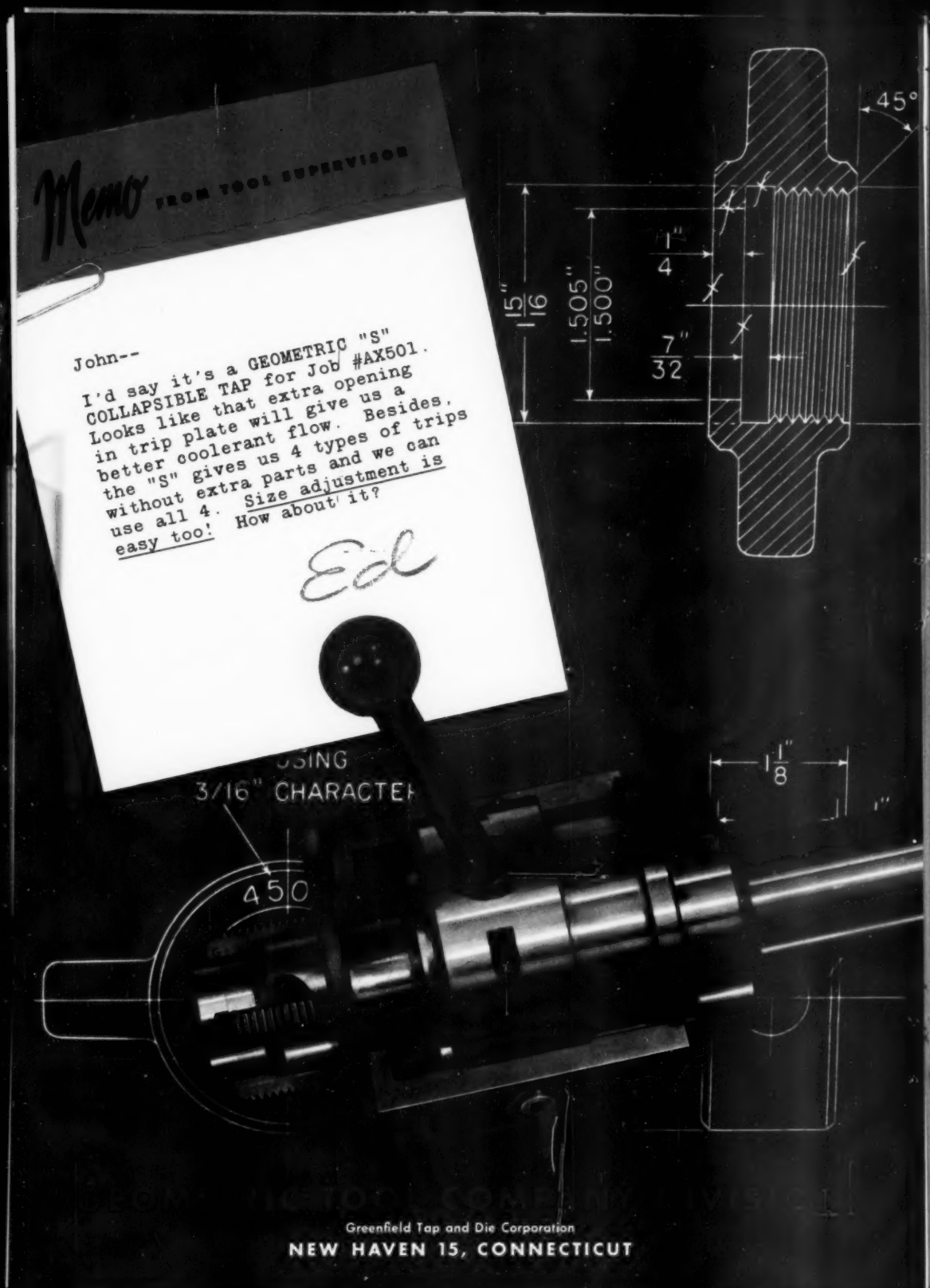
Why GTD Greenfield?

At "Greenfield," nothing is left to chance, nothing is taken for granted. Attention is given to every detail — to insure a product as near perfect as modern engineering skill can make it.

Take tap chamfering. At "Greenfield," skilled operators working at specially designed automatic chamfering machines turn out taps which exceed all previous standards of perfection. Correct angle, concentricity, and length of chamfer in a tap insure a good tapping job for you. "Greenfield" taps, precision perfect, are your greatest guarantee of good tapping *every time*.

GREENFIELD TAP AND DIE CORPORATION
Greenfield, Massachusetts

BUY GTD GREENFIELD!


Memo FROM TOOL SUPERVISOR
John--
I'd say it's a GEOMETRIC "S" COLLAPSIBLE TAP for Job #AX501. Looks like that extra opening in trip plate will give us a better coolerant flow. Besides, the "S" gives us 4 types of trips without extra parts and we can use all 4. Size adjustment is easy too! How about it?
Ed
45°
15/16"
1.505"
1.500"
1"/4
7"/32
1 1/8"
3/16" CHARACTE
45

Greenfield Tap and Die Corporation

NEW HAVEN 15, CONNECTICUT

Jobs like these...

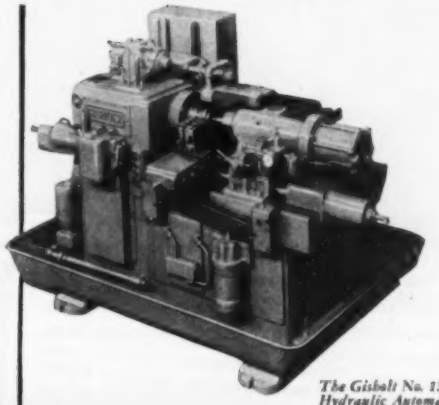
on a Job-Lot basis...

on Automatic Lathes?

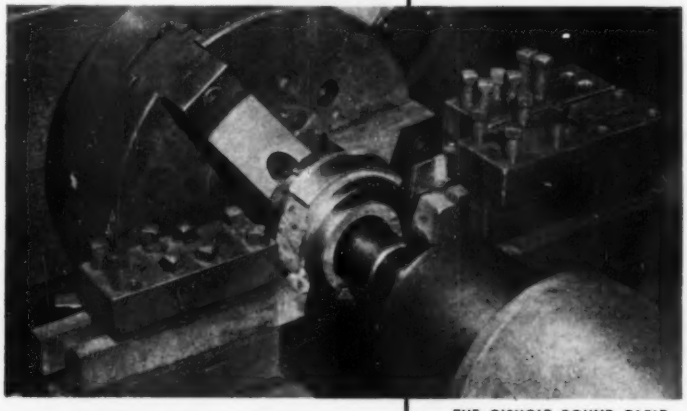
Absolutely! And these are only 8 of over 200 actual small-lot jobs handled on Gisholt No. 12 Hydraulic Automatic Lathes. The Crompton and Knowles Loom Works of Worcester, Mass., has *four* No. 12 Hydraulics busy producing and saving on work like this . . . and all with standard tool blocks!

Job-lot work like this—and like yours—is a natural for the No. 12 Automatic. The cost is no more than a hand-operated lathe for work this size . . . yet you have the added advantages of automatic machining and one-man operation of two or more machines.

If you have contract work like this, now or pending, it will pay you well to get the facts on the No. 12 Hydraulic Automatic Lathe. There's a big 24-page catalog free for the asking.



The Gisholt No. 12 Hydraulic Automatic Lathe gives you speed and accuracy plus *easy set-up.*



GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

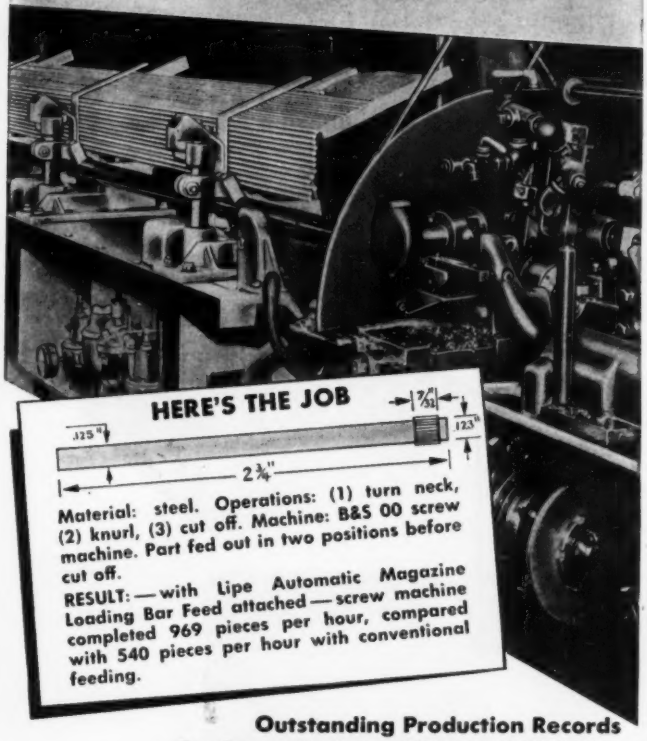
TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

A New Record

PRODUCTION INCREASED over 80%

By Lipe Automatic

Magazine Loading BAR FEED



HERE'S THE JOB

Material: steel. Operations: (1) turn neck, (2) knurl, (3) cut off. Machine: B&S 00 screw machine. Part fed out in two positions before cut off.

RESULT:—with Lipe Automatic Magazine Loading Bar Feed attached—screw machine completed 969 pieces per hour, compared with 540 pieces per hour with conventional feeding.

Outstanding Production Records On Great Variety of Work, BECAUSE—

- Stock is fed to screw machine all the time—not dependent upon operator.
- Pressure constantly behind stock.
- Eliminates feed fingers.
- Avoids multiple feed finger feed-outs.
- With Model AML you get maximum output of screw machine—no "cutting air".
- Saves in changeover set-up time.

Get full details on how this machine will increase production and save you money. It's today's big advancement in screw machine stock feeding. Our engineers are glad to study your problem . . . no obligation.

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION

Syracuse 1, N. Y.

NEW BOOKS

A BIBLIOGRAPHY OF STATISTICAL QUALITY CONTROL—SUPPLEMENT. *By Grant I. Butterbaugh. Published by University of Washington Press, Seattle, Wash. 141 pages, paper-bound. Price $2.*

This book supplements the original annotated bibliography which listed over 700 articles, manuals, and books on the subject of quality control. These had appeared during the period from 1924 until the beginning of 1946. The supplement covers the period from 1946 to June, 1949, and includes approximately 725 additional listings on the subject of statistical quality control. The index is for both the original volume and the supplement, with the suffix "s" added to key numbers to designate those items listed in the supplement.

•

METAL CLEANING BIBLIOGRAPHICAL ABSTRACTS (1950 SUPPLEMENT) *—By Jay C. Harris. Published by the American Society for Testing Materials, 1916 Race St. Philadelphia 3, Pa. 32 pages. Price $1.00.*

Bringing up to date the original edition, published in 1949, this supplement contains 89 additional references for 1932 to 1948, and 81 new references for 1949 and 1950. As in the original bibliography, the references are arranged by year and by author, and are indexed by subject, author, specification, and patent.

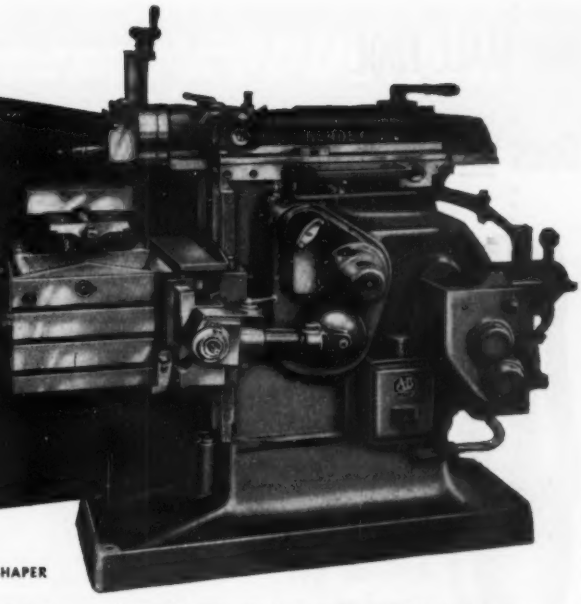
This publication, together with the original one, will be of great value and interest to all concerned with the surface condition and cleaning of metals.

•

THE AMA HANDBOOK OF WAGE AND SALARY ADMINISTRATION—*Edited by M. Joseph Dooher and Vivienne Marquis. Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 412 pages. Price $7.50.*

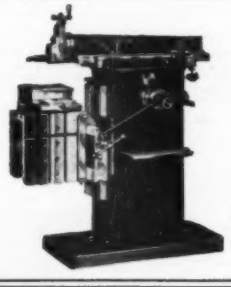
A complete guide to the principles and techniques of wage and salary administration, this book is an integrated compilation of material published by AMA and contains sections written by more than 20 people in the field. As the requirements that must be considered at every stage

...If you are not using Modern Hendey Machines you are not earning the profits that you should!



1951
12" UNIVERSAL CRANK SHAPER

A comparison of the old Hendey Friction Shaper with the NEW Hendey 12" Universal Crank Shaper will instantly reveal the profit possibilities that you may be missing. The modern Hendey Shaper offers the most complete, up-to-date shaper available today. Full standard equipment means that there are no "extras" to buy. This equipment *includes* table and vise for positioning and indexing work to any angle—flanged mounted motor—mechanical controls *on both sides*—fully automatic lubrication—quick change swivel head—adjustable, preloaded Timken bearings on the bull gear. The 12" Hendey covers a range which makes it ideal for tool room and production work. Hendey Shapers are also available with capacities from 16" to 28", both standard and heavy duty. Write for full details on the modern Hendey Shapers.



1920

Still using old 15" Hendey friction drive shapers? They have only 2 speeds, 21 and 30½ strokes per min., as against 8 speeds from 14—200 for the new 12" shaper. Surveys prove that the new 12" Universal High Speed Crank Shaper covers a majority of all jobs in most plants. Mechanical changes are almost too numerous to mention—improved accuracy, speed and profits on the new 12" shaper will easily convince you of the advisability of changing *now*!

Continuous, advanced engineering by Hendey is worth watching—and must be watched if you are to earn full profits from your lathes and shapers. For complete particulars and prices, contact your nearest Hendey office.

MODERN Hendey

THE HENDEY MACHINE COMPANY
MAIN OFFICE & PLANT: TORRINGTON, CONN.
BRANCH OFFICES: New York, Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco
REPRESENTATIVES. Philadelphia, Cleveland, Pittsburgh

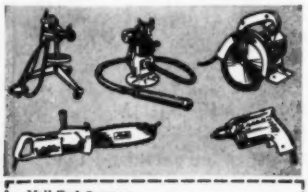
One MALL TOOL

Does all These Jobs

saves up to 89% on nut running operations alone

Drills • Screws • Taps • Wire Brushes • Hammers • Stud Sets Bolts • Saws • Nut Runs • Reams

PUTS POWER INTO MAN-POWER . . . a fast-working portable tool with special "tork-hammer" action. Gives 2000 tremendous rotary impacts per minute for all tightening and removing operations. Lightweight but plenty tough! Features new universal motor that won't stall. Ideal for work in close quarters. Dozens of attachments available to cut work and speed production even more.



Mall Tool Company
7731D S. Chicago Ave., Chicago 19, Illinois
☐ Please send me free literature on the MALL TORK-HAMMER.
☐ I would like a free demonstration in my own plant.

Name_____
Company_____ Dept._____
Address_____
City_____ State_____
Kind of Tool_____

Mall® POWER TOOLS
Put POWER into MANPOWER
Manufacturers of over 1000 Tools for a Million Jobs

of planning and administering a program are discussed, the book is intended both for companies setting up a plan for the first time and for those who are revising their present program.

In addition to the basic principles of wage and salary administration, including job evaluation and standardization, the book covers such subjects as: how to conduct and use a wage survey; case histories in wage and salary administration; salaried jobs; and supervisory and executive salary administration.

•

INTRODUCTION TO MECHANICAL DESIGN —*By T. B. Jefferson, editor, The Welding Engineer, and Walter J. Brooking, Special Projects Department, M. W. Kellog Company. Published by The Ronald Press Company, 15 E. 26th St., New York 10, N. Y. 603 pages. Price, $6.50.*

Although this text was awarded first prize in the machine-design division of a competition for modernized design textbooks, sponsored by the James F. Lincoln Arc Welding Foundation, it contains a much higher percentage of practical information than the normal machine-design text. Well illustrated with sketches, diagrams, and photos, the book presents information on engineering materials, forming and fabricating, fastenings, machine elements, bearings, gears, chains and belts, springs, piping, and styling for the market, as well as fundamental design theory.

Unfortunately, as might be expected, the book is heavily loaded in the direction of welding as a production process, and little attention is paid to other processes. Actually, as the book is a design volume, this is unimportant; but the effects of fabrication by welding on design—which are important—are too heavily stressed for a design reference.

As a reference in the welding field, as a practical reference book for design engineers interested in welding processes, and as a rough, not-too-penetrating text for students in engineering, this book should find fair acceptance. It would perhaps be an excellent text for freshmen college engineers in introductory courses.

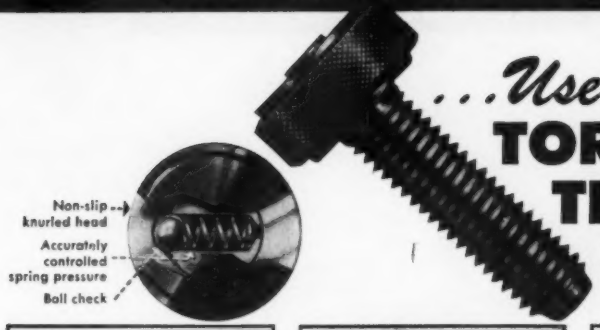
•

SOURCES OF ECONOMIC INFORMATION FOR COLLECTIVE BARGAINING—*By Ernest Dale. Published by American Management Association, 330 W. 42nd St., New York 18, N. Y. 171 pages, paper-bound. Price $3.75.*

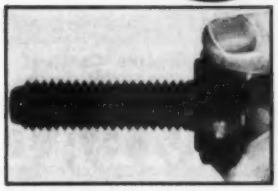
This study, AMA Research Report No. 17, examines data available for negotiations on wage rates. It discusses the source figures and the arguments of both management and unions regarding the criteria most commonly used in wage-rate determination: cost of living, productivity, "going" wage rates, and "ability to pay." The study is intended not only as a bibliography of sources of wage data, but as an analysis of the value and limitations of the various criteria.

LOOK AT THAT MESS! ALL THEM BOARDS ARE NINE INCHES TOO LONG- WHAT KLUNK-HEAD TOLD THEM MORONS T'MOVE MY BENCH AWAY FROM THAT POST? YOU HAVE OTHERS DO YOUR JOKING NOW, EH?
I JUST DO WHAT I'M TOLD T'DO.
DON'T FLATTER YOURSELF—WE ALL KNOW THAT!
"ONE OF THOSE THINGS"

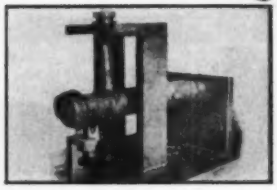
How to Increase PRODUCTION
(And Reduce Parts Rejects)



...Use VLIER TORQUE THUMB SCREWS



VLIER Torque Thumb Screws are holding tools that *automatically* prevent distortion of work pieces due to over-tightening.



VLIER Torque Thumb Screws firmly support work pieces against drill or mill thrust as shown.

VLIER Torque Thumb Screws quickly provide accurate holding pressures — save time in changing work pieces.

As shown above, VLIER torque thumb screws are simplicity in themselves . . nothing to wear out or cause production stoppages. The spring-controlled ball check *automatically* prevents over-tightening without any attention on the part of the machine operator. *Absolute uniformity of product is guaranteed!* Choose the torque thumb screws you need from the many types available.

REGULAR, Type A — for general use

Item No.	Size	Overall Length	Head Dia. & Width	End pressure in lbs.
T-100	6 x 1¼	1 11/16"	⅞" dia. x 7/16"	10 to 12
T-101	8 x 1¼	1 11/16"	⅞" dia. x 7/16"	10 to 12
T-102	10 x 1½	1 11/16"	⅞" dia. x 7/16"	10 to 12
T-103	⅛ x 1½	2 3/16"	⅞" dia. x 7/16"	12 to 14
T-104	⅜ x 1¾	2¼"	1⅛" dia. x ½	16 to 18
T-105	⅜ x 3	3½"	1⅛" dia. x ½	16 to 18
T-106	½ x 1¾	2¼"	1⅛" dia. x ½	18 to 20
T-107	½ x 3	3½"	1⅛" dia. x ½	18 to 20
T-108	⅝ x 1¾	2¼"	1⅛" dia. x ½	20 to 22
T-109	⅝ x 3	3½"	1⅛" dia. x ½	20 to 22

INVERTED, Type B — supports work on opposite end

Item No. & Size		End Pressure (lbs.)
T-125	¼ x 1¾	12 to 14
T-126	⅜ x 1¾	16 to 18
T-127	½ x 1¾	18 to 20
T-128	⅝ x 1¾	20 to 22

TEEHEAD, Type C — for use with sliding V-blocks

Item No. & Size		End Pressure (lbs.)
T-150	¼ x 1¾	18 to 20
T-151	⅜ x 1¾	24 to 26
T-152	½ x 1¾	26 to 28

Also available in adjustable type where you set your own holding pressure.

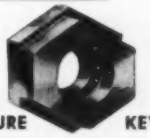
Other VLIER products include:

SPRING PLUNGERS

Available in 11 sizes. Used for positioning, or wherever spring tension is desired.

SPRING STOPS

Designed for quickly positioning work pieces and providing 14 or 32 lbs. spring holding tension.



FIXTURE KEYS

Amazing timesavers. Allow work changeovers with practically no "down time."

MACHINE TOOL SPECIALTIES

Write for catalog or see your local VLIER Distributor for further information.

VLIER MANUFACTURING CO.
4552 Beverly Blvd., Los Angeles 4, Calif.

An ounce of prevention

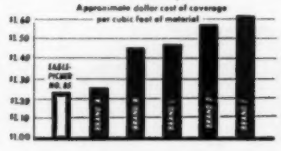
EAGLE-PICHER INDUSTRIAL FLOOR DRY NO.85

is worth a pound of cure

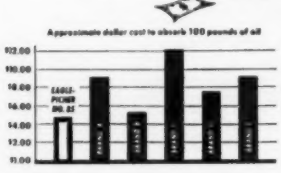
Eagle-Picher Industrial Floor Dry No. 85 is a granular mineral compound—chemically inert, non-combustible, and insoluble in oil, grease, kerosene or water. It can give you positive reduction in operating costs plus greater safety. Write for complete information.

Here's proof that Eagle-Picher Floor Dry No. 85 is tops in efficiency, economy

Comparative Coverage Costs



Comparative Absorption Costs



Packed in convenient 50-pound, multi-wall Kraft paper bags

The Eagle-Picher Company

GENERAL OFFICES: CINCINNATI (1), OHIO

2084-D*

The Eagle-Picher Company
Department AM-4-51
Cincinnati (1), Ohio

Gentlemen: Please send me complete information about Eagle-Picher Industrial Floor Dry No. 85.

EAGLE EP PICHER

Name_____

Address_____

City_____ County_____ State_____

NEW MEAD INDUSTRIAL

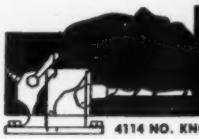
AIR POWER CATALOG Ready!

Full of Suggestions for **FASTER, CHEAPER PRODUCTION!**

Illustrates, describes Air Cylinders, Valves, air operated Presses, Vises, Chucks, Hammer, Drill Press Feeds, Work Feeders, Timers, Semi-automatic combinations, etc.

**Pneumatic Cylinders*

Write for Complete Catalog!



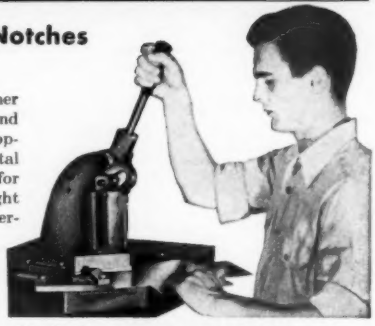
MEAD SPECIALTIES COMPANY

4114 NO. KNOX AVE., DEPT. MA-41, CHICAGO 41, ILL.

THE di-acro NOTCHER

Duplicates Precision Notches WITHOUT DIES!

The new precision DI-ACRO Notcher eliminates the need for punch press and dies on many production notching operations. It is also ideal for experimental work as it can be quickly adjusted for any size or shape notch. Many straight shearing operations can also be performed with this flexible unit.



CUTS CLEAN—NO BURRS OR ROUGH EDGES

The powerful DI-ACRO Notcher has an exclusive roller bearing cam design which provides a tremendous pressure with a small amount of effort. The precision-ground Vee-shaped ram and blades of alloy tool steel assure clean cuts and permanent accuracy.

LARGE CAPACITY. The DI-ACRO Notcher cuts 90° notches up to 6" by 6" in 16 gauge steel in one operation. Larger notches, and wider or narrower angles, can also be obtained.

SEND FOR 40-PAGE CATALOG. Gives full information on all six "DIE-LESS DUPLICATING" production boosters—DI-ACRO Benders, Brakes, Shears, Rod Parters, Punches, Notchers—with many examples of accurately duplicated parts.

DI-ACRO is pronounced "DIE-ACK-RO"

DI-ACRO PRODUCTION EXAMPLES

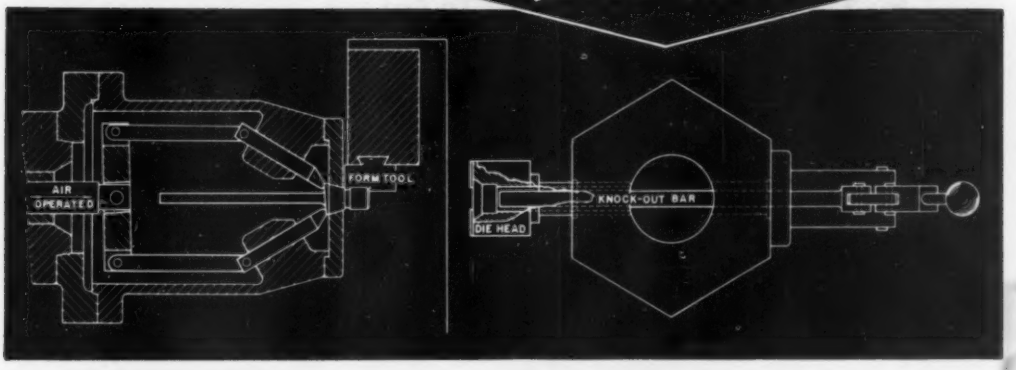
DI-ACRO DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

311 EIGHTH AVENUE, LAKE CITY, MINN.

YOU CAN USE IDEAS

Like This

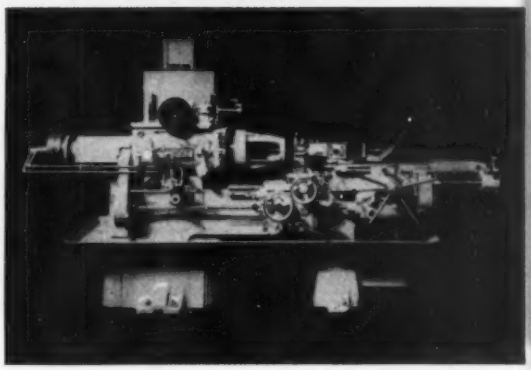


WITH GISHOLT TURRET LATHES

Here's a turbine blade job. It is a tough job to hold because not only are there a number of different blades, each of different length, but the work must be located and held against a tapered surface. It requires a special fixture. An air-operated plunger through the spindle forces the taper against the locating seat on the fixture, holding all sizes firmly.

The machining is done on the shank end. It must be turned and faced and necked for thread relief. Form tools on the rear of the cross slide handle all this in a single pass. Threading is done from the turret and a hand-operated knock-out bar loosens the blade from the fixture after the threading is completed. Production is more than adequate to meet the contract requirements.

This kind of investment pays off handsomely. If you are looking for practical, cost-cutting ideas, why not let Gisholt engineers help you. They have been specialists in turret lathe work for over 60 years.



Gisholt lathes are ideal for high speed work of this kind. With hydraulic spindle control, the Gisholt Speed Selector, and many other automatic features, operating time and effort are reduced to a minimum. Ask for literature.

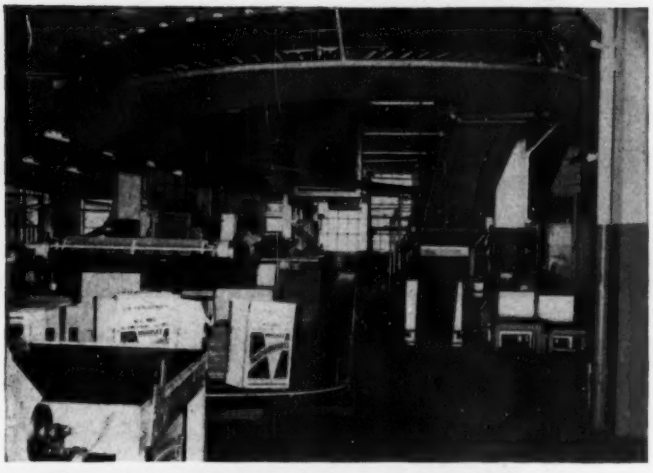
GISHOLT MACHINE COMPANY
MADISON 10, WISCONSIN

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

Start With Any One of These

FOUR WAYS To Cut Your Handling Costs



1 WITH ROLLER OR BELT CONVEYORS

— Wherever packages, parts, or units have to be handled — do it faster, better, cheaper, with Standard roller or belt conveyors, power or gravity. Standard also builds slat, chain, wheel, or pushbar conveyors to fit your needs.

2 with a HANDIBELT

— a small, light, compact, easily portable and maneuverable conveyor unit that stacks, loads, unloads cases, cartons, packages up to 135 lbs. in weight. Can be used inclined, declined or horizontal. Electric motor operated.

3 with SPIRAL CHUTES

— effective time, work and money savers lowering pieces, parts, packages floor to floor. Scientifically designed and properly pitched—available in many types and sizes. Cost nothing to operate.

4 with PNEUMATIC TUBE SYSTEMS

— provide swift, sure, safe transportation of messages, documents, blueprints, samples, small parts, money; cylindrical or oval tubes 1½ inch upward with dispatching and receiving terminals for complete systems to meet your needs. Write for special bulletin SPT.

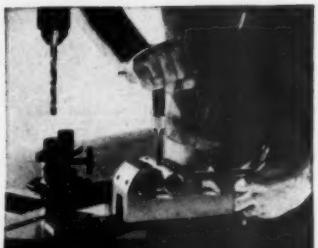
Write for Standard's general Catalog No. AM-41. Tell us what you want to handle or name equipment on which you want more information.

VISIT US AT BOOTHS 148-149, NATIONAL MATERIALS HANDLING EXPOSITION AMPHITHEATRE, CHICAGO, APRIL 30-MAY 4.

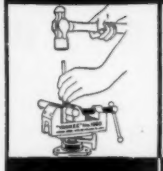
STANDARD CONVEYOR COMPANY
North St. Paul 9, Minn.
Sales and Service in Principal Cities

Standard
GRAVITY & POWER
CONVEYORS

SPEED UP SMALL JOBS with "YANKEE" VISES



Yankee 1993 Vise, removed from swivel base and held by Yankee Vise Clamp for drilling and tapping.



Bench-mounted on quick-release swivel base.

Machine-mounted with Yankee Clamp.

Sides, bottom and front end accurately machined.

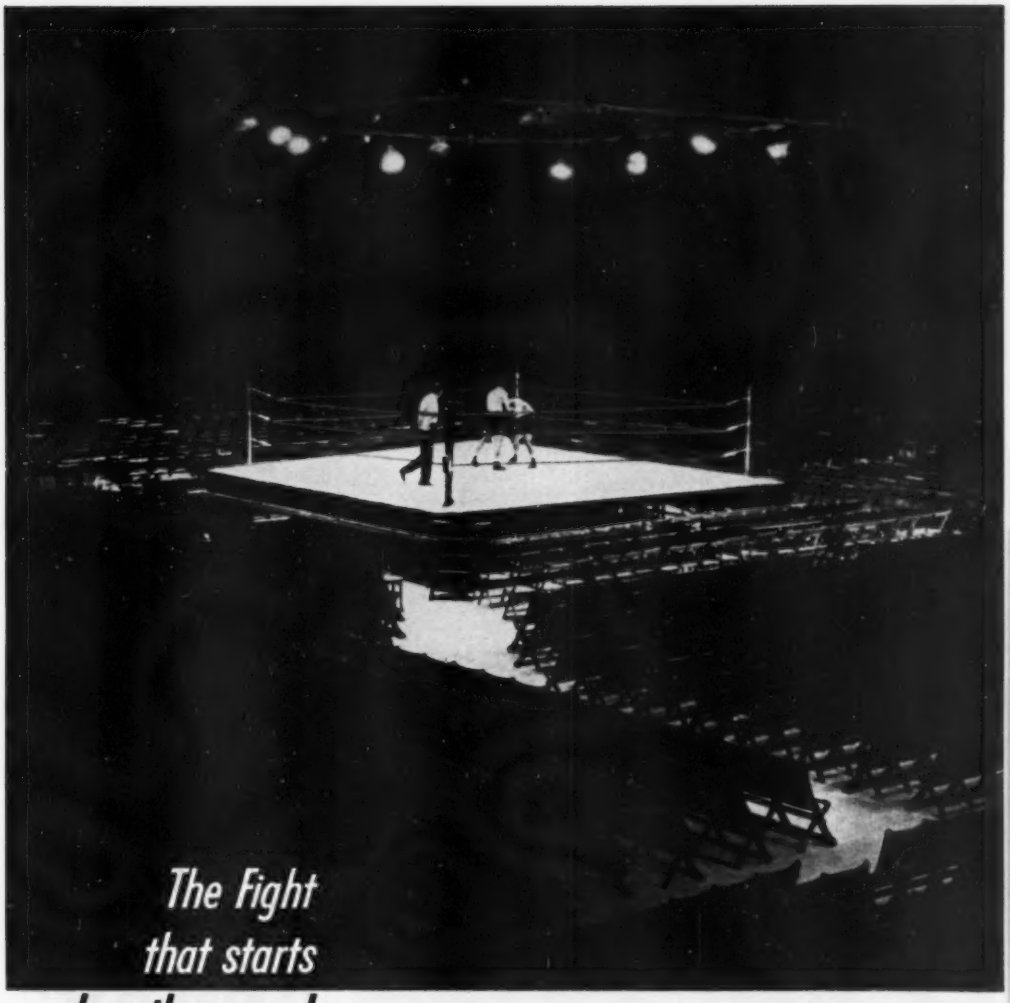
Vise lifts on and off swivel base.

Line up small work just once in a "Yankee" Vise for a whole series of hand and machine operations. Four sizes ... 1½", 2", 2¾" and 4" jaw widths ... with and without swivel base. Hardened steel "V" block for round stock. Your industrial distributor has a full stock.

Write for The "YANKEE" Tool Book

"Yankee" Tools now part of
STANLEY
THE TOOL BOX OF THE WORLD

NORTH BROS. MFG. CO.
Philadelphia 33, Pa.



The Fight that starts when the crowd goes home

For one man, the fight just begins when the last punch is landed at Madison Square Garden.

His fight, however, is against time.

He rushes the film of that last Friday bout to the laboratory, and adds it to films made all week at the famous arena. The result: an exciting film program called: "This Week at Madison Square Garden."

And in just a few days, television viewers all over the country are cheering the thrilling events!

With so little time between that last punch and the TV deadlines, his fight against time seems hopeless. Yet he wins it every week—thanks to Air Express!

Air Express speed gives him time to edit and process his films, and get them safely and cheaply to stations everywhere.

And the same speed that meets TV deadlines can help production deadlines, too! Whether your business is films or factories, here are the unique advantages you can enjoy with regular use of Air Express!

IT'S FASTEST — Air Express gives the fastest, most complete door-to-door pick up and delivery service in all cities and principal towns, *at no extra cost.*

IT'S MORE CONVENIENT—One call to Air Express Division of the Railway Express Agency, arranges everything.

IT'S DEPENDABLE — Air Express provides one-carrier responsibility all the way and gets a *receipt upon delivery.*

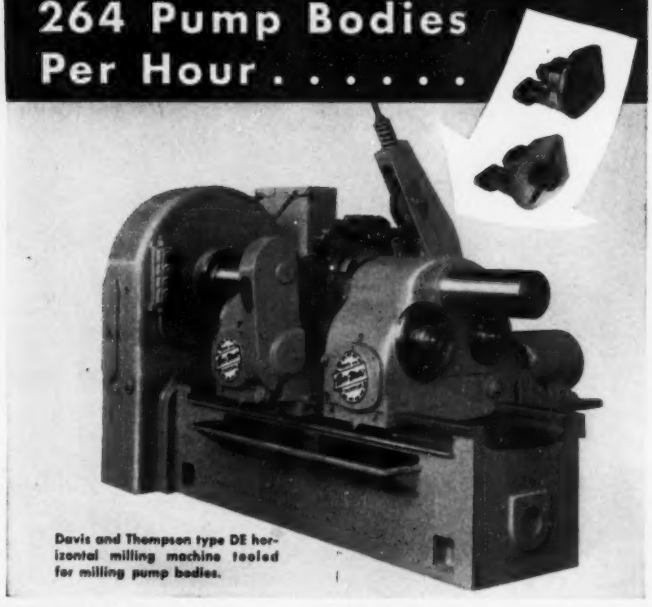
IT'S PROFITABLE—Air Express expands profit-making opportunities in distribution and merchandising.

For more facts call Air Express Division of Railway Express Agency.

AIR EXPRESS

GETS THERE FIRST

264 Pump Bodies Per Hour . . . . . .



Davis and Thompson type DE horizontal milling machine tooled for milling pump bodies.

1-A Standard Horizontal Milling Machine

Oil pump bodies requiring high degree of finish and high production are rough and finish milled on both sides simultaneously with this Davis and Thompson type DE milling machine. Production is 264 pieces per hour.

Patented Angular Spindle Adjustment Allows "Toe Cutting"—Maintains Fine Finish at High Production

The finishing spindle is provided with an exclusive D&T design which allows angular adjustment. This in turn results in "toe-cutting" and eliminates "drag" of the cutter over the finished surface. Both roughing and finishing spindles have micrometer endwise adjustment.

A Basically Standard Machine Employing Roto-Matic Principle For High Production Special Milling

Like all D&T machines this model DE is designed for long life and trouble-free operation. Each head has independent drive. There is backleash take up to mandrel. Anti-friction bearings throughout. Rapid traverse between cuts can be incorporated.

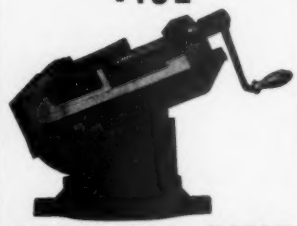
Free Data will be furnished upon request.

DAVIS and THOMPSON Roto-Matic

Davis & Thompson Company

6411 W. BURNHAM ST., MILWAUKEE 14, WISCONSIN

Let the *Master Multi-Swivel* VISE



SAVE YOU TIME

on intricate, angular set-ups

Fully universal, 3 swivels simplify the setting of compound angles. Parts are interchangeable. Can be used as a plain flanged vise, swivel vise, and multi-swivel vise.

OPTIONAL ACCESSORY

Platen, interchangeable with vise. Increases capacity of unit. Uses: as plain platen, multi-swivel platen.

Master Multi-Swivel Vises and accessories are used in machine shops throughout the world. For further information write

DONOVAN MFG. CO.

80 Batterymarch St., Boston, Mass.

"FRAY" MICROMETER OFFSET BORING HEAD

It's safe—no projections. Smooth, rounded edges.

Easily read graduations.

Two boring bars supplied with each head.

WRITE FOR DETAILS

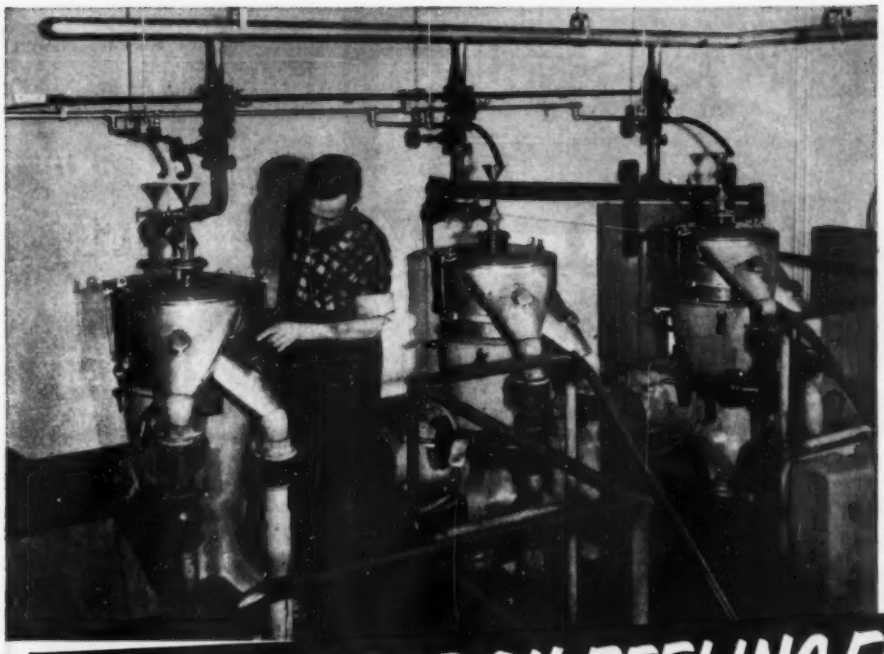
Produced under Patent 2305737

FRAY MACHINE TOOL CO.

515 W. Windsor Rd., Glendale 4, Calif.

From the *American Machinist* Library of *Tips for Top Shop Men*

IF you have worked with your hands, your normal tendency in a crisis will be to work with your hands again. There are times when this will impress the men who work for you, do much to knock down any idea that you're an incompetent stuffed shirt. But never forget that you're paid now for working with your head, and that headwork demands more perspective than handwork is likely to give you. Also remember the thrill you got out of achievement and give the next generation the same chance to grow.



HOW TO KEEP OIL FEELING FIT!

Centrifuge oil in a De Laval Oil Purifier and you remove from it ***both*** of the agents that tend to contaminate it —water and dirt. Almost all factory oils, such as cutting oil, grinding coolant, test oils and general lubricating oils, can properly be kept free from solid impurities and be used safely over and over again when they are purified by this means. The De Laval machine promptly throws out every metallic particle or bit of dirt that might injure the work or interfere with proper lubrication.

Sometimes the need is to dehydrate an oil, as in the case of hydraulic oil or vacuum pump seal oil. Here again, De Laval machines answer the need best, for when they remove water from oil it stays removed—it cannot ever recontaminate the oil.

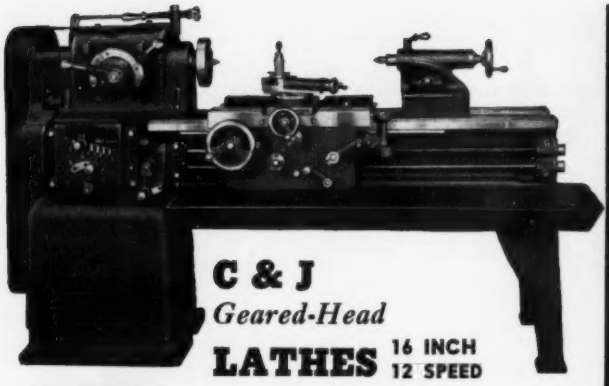
Practically every metal-working plant can use De Laval Oil Purifiers for more than one application.

Write for Bulletin MM-1 for a list of uses. It may pay you well.

DE LAVAL
PURIFIERS and CLARIFIERS FOR FACTORY OILS

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

for greater operating efficiency



C & J *Geared-Head* LATHES 16 INCH 12 SPEED

ONLY ONE MODEL • ONLY ONE SIZE

FOR HIGH GRADE PRACTICAL GENERAL SERVICE

- Tooled and equipped for efficient production
- Exceptionally long carriage bearing—23½ in.
- Feed provided by separate rod—lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

Guaranteed accurate to good commercial standards. Write TODAY for new bulletin 38-A-8.

CARROLL & JAMIESON MACHINE TOOL CO.
BATAVIA, OHIO

Weldit TORCHES . . .

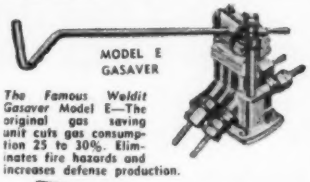
Unsurpassed for TOP Performance

For 33 years management men and welding operators combine to put the stamp of approval upon *Weldit torches* for these important reasons: superior quality of work, greater productive capacity, gas saving economy and minimum maintenance cost.

Weldit Weldimatic torches are indispensable for defense work because they will increase your production up to 148% plus, an average gas saving per operator of $4.80 per day.

MODEL W-46 WELDIMATIC

The *Weldit* Model W-46 Weldimatic welding torch with built in automatic gasaver. *Safe—Speedy—Rugged—Light.*



MODEL E GASAVER

The Famous Weldit Gasaver Model E—The original gas saving unit cuts gas consumption 25 to 30%. Eliminates fire hazards and increases defense production.

WRITE FOR TECHNICAL BULLETINS NOS. 3 and 10

Name .....

Company .....

Street ..... City .....

WELDIT TORCHES . . .
For the Man Who Carries the Torch

996 OAKMAN BLVD. **Weldit** INC. DETROIT 6, MICH.

Canadian Distributors • Alloy Metal Sales • 881 Bay St., Toronto 5, Ont.

L&I

makes only the FINEST QUALITY REAMERS

L&I Reamers 1/16" thru 1½" by 64ths are standard and are carried in stock. Sizes thru 5/16" are ground from the solid after hardening for dimensional stability. Grinding of both faces provides finer cutting edges, permits faster feeding and keeps resharpenings to a minimum. Flutes are ground for easy chip removal.

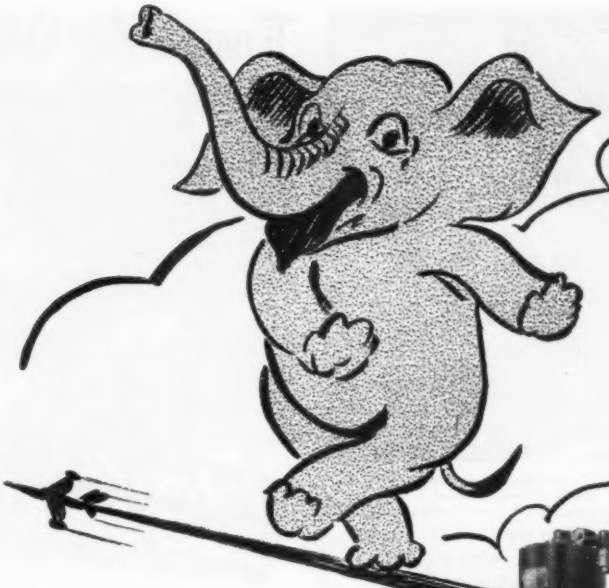
In sets for your convenience

Letter, Wire Gage and Fractional Size Reamers are available in sturdy folding metal cases. Write for catalog or see your L&I Distributor.

L&I

The Reamer Specialists

LAVALLEE & IDE, INC.
CHICOPEE, MASS.



He knows how

HE'S DONE IT BEFORE

Sciaky Know-How in Resistance Welding of Aluminum to MIL-6860 and 6858 Specifications is Based on Past Performance, Too!

THE talented elephant is simply a means of calling to your attention *SCIAKY'S* experience in welding aluminum. Nearly all resistance welders being used today for welding to both MIL-6860 and MIL-6858 (formerly known as ANW-30 and 32) Air Force-Navy Specifications are *SCIAKY* machines. Sciaky leadership in aircraft welding and welding of non-ferrous and ferrous alloys is based on early pioneering and constant research in this specialized type of work.

Today, the new *SCIAKY* Series PMCO2ST Three-Phase Modu-Wave Welder offers new benefits to the aircraft industry and others welding aluminum, magnesium, brass, mild steel, monel, inconel, stainless, heat-resisting alloys and others. The new machine is quickly adjustable to handle them all! Quality of welds is unsurpassed and tip life is as much as 300% greater than with previous welders.

Sciaky guarantees to qualify the PMCO2ST Welder to MIL Specifications at the time of installation in your plant. For complete data on the welder that leads the field in meeting aircraft welding standards, write today.

NEW SERIES PMCO25T

100 KVA at 50% duty cycle. 220 and 440 volt 3-phase 60 cycle standard. Available with special controls for 25 and 50 cycle current. Standard throat depths 36" and 54". Welding range to MIL specifications (two thicknesses): aluminum and magnesium alloys .025" to .081". SEND FOR NEW BULLETIN.

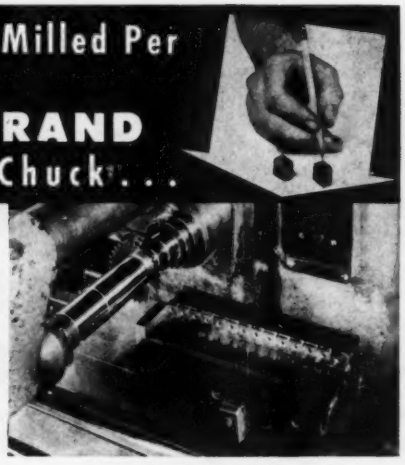
SCIAKY BROS. INC.

4919 W. 67th St. • Chicago 38, Ill.

SCIAKY

SAY "SEE-ACKY"

350 Pieces Milled Per Hour With SUNDSTRAND Magnetic Chuck . . .



Close-up showing method of holding work in Sundstrand Magnetic Chucks.

Rigid Holding Results in 40,000 Pieces Milled Without Cutter Sharpening

Here's a good example of the production help you can get with Sundstrand Magnetic Chucks. This chuck, with adaptor plate, side locator and end stop, holds 14 pieces in a row for milling a slot 3/32" wide x 1/2" deep. The part is a small steel retainer nut which is difficult to hold because of the size of cut. A 3" dia. slotting cutter mills 350 parts per hour, and approximately 40,000 pieces have been milled without cutter being changed or sharpened. If you need more production, investigate Sundstrand Magnetic Chucks.

How To Increase Your Milling Production With a SUNDSTRAND MAGNETIC CHUCK

Whether you have tool room, production or special holding problems, look into the possibilities of eliminating expensive clamping and increasing production with Sundstrand Magnetic Chucks. Get this free booklet. Ask for bulletin 106-M.

SUNDSTRAND MAGNETIC POWER-GRIP

SUNDSTRAND
Magnetic Products Co.
Division of Sundstrand Machine Tool Co.
1306 18th AVE. • ROCKFORD, ILLINOIS

Time it in Your Shop!

Prove it's a MONEY SAVER!

Install one Dodge Slide-Set vise and compare it with the best conventional type vise you have. Check the time it saves your operators. The Dodge Slide-Set eliminates tedious handle-spinning. Jaw slides to desired position—open or closed—in one second.

In some shops Slide-Set has saved as much as 50% of the time consumed in clamping work. It cuts operator fatigue. In addition it has all the ruggedness and stamina required for machine shop and production operations. Ask your Distributor to demonstrate.

DODGE
SLIDE-SET VISE

New, fast, rugged, and revolutionary! 1. Turning handle counter clock-wise throws vise into "neutral" for fast slide action. 2. A push closes jaws on work, (or a pull opens). 3. Turning handle clock-wise applies full pressure conventionally. No-pinch handle protects against blood blisters. Write now for free Bulletin.

DODGE MANUFACTURING CORPORATION
100 Union Street, Mishawaka, Indiana

DODGE
of Mishawaka, Ind.
FIRST IN POWER TRANSMISSION MACHINERY

FOR SMALL
JIG BORING
PUT SMALL JOBS ON THIS
LINLEY MACHINE

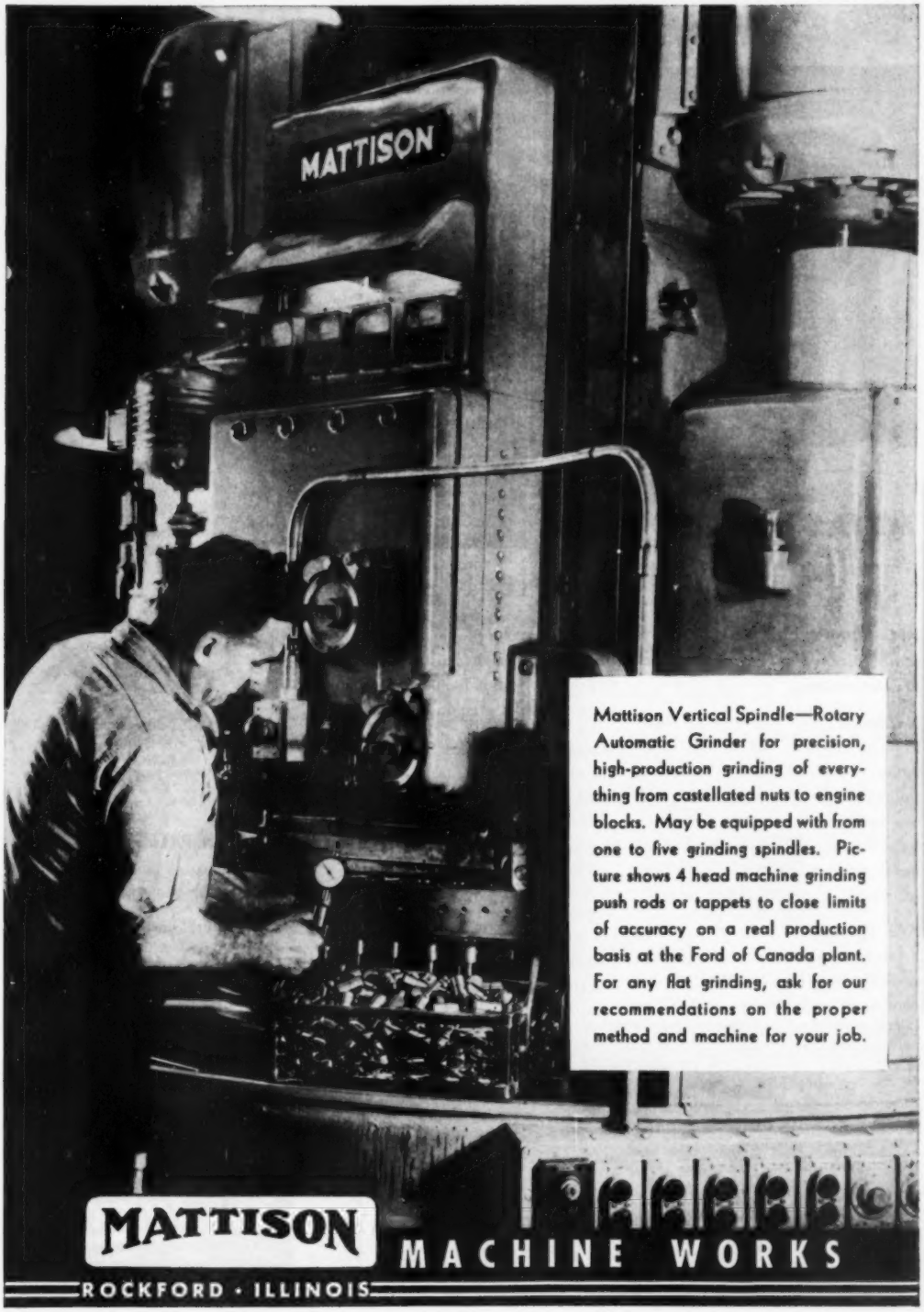
and save your larger machines for heavier work.

YOU'LL BE SURPRISED!

at the extremely low first cost and the vitally important jobs that this little precision machine can do. It will pay you to get our accuracy information on this machine which has 6" x 10" table movement and 7' x 17½" table size.

Write TODAY For Full Information

LINLEY BROTHERS COMPANY
664 State St. Ext., Bridgeport 1, Conn.

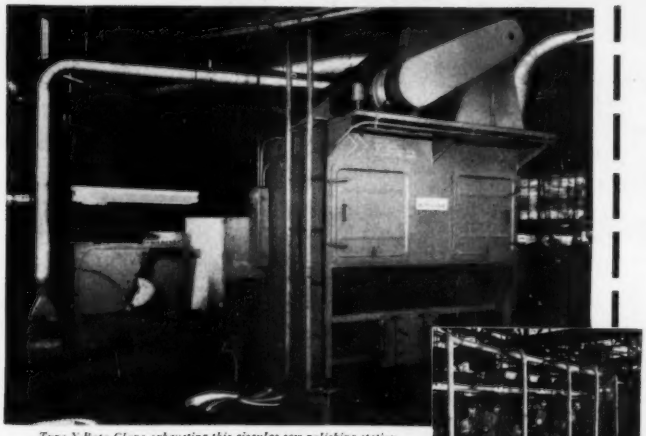


Mattison Vertical Spindle—Rotary Automatic Grinder for precision, high-production grinding of everything from castellated nuts to engine blocks. May be equipped with from one to five grinding spindles. Picture shows 4 head machine grinding push rods or tappets to close limits of accuracy on a real production basis at the Ford of Canada plant. For any flat grinding, ask for our recommendations on the proper method and machine for your job.

MATTISON MACHINE WORKS

ROCKFORD • ILLINOIS

today's best buy is better air!



Type N Roto-Clone exhausting this circular saw polishing station and other dust sources at The E. C. Atkins & Co., Indianapolis. One Battery of five tooth-grinders exhausted by Type D Roto-Clone.

METAL DUST CONTROL

...for millions of teeth!

Roto-Clone's Flexible Unit System Solves Problems for Saw Manufacturer.

No dental clinic has seen as many teeth as they turn out at The E. C. Atkins & Co., Indianapolis. Grinding, polishing and cleaning millions of saw teeth create complex dust problems that are basically a part of all metal working industries, but in this instance . . . *are all under one roof.*

AAF Roto-Clone* units in replacing a large, old-style central system now provide complete flexibility of dust control at each source, as well as many other advantages. For example: small Type D Roto-Clones with viscous after-cleaners allow recirculation of cleaned air from all polishing and dry grinding operations with consequent seasonal heat saving. Also, the Type D's permit rapid re-arrangement of machinery on production lines with their exhaust ventilation and dust collectors included as an integral part of the equipment.

Where fire is a hazard (as in polishing operations) or for dust sources that produce heavy loadings and fine particle sizes, the Type N Roto-Clone wet-collectors are used for their safety and high efficiency.

The complete line of Roto-Clones includes many types, sizes and arrangements that meet every metal working or finishing problem. For complete information call your nearby AAF representative or write for Engineering Bulletin No. 270.

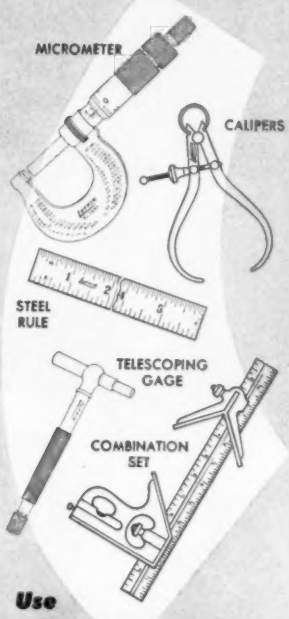
**ROTO-CLONE is the trade-mark (Reg. U. S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic percipitator and hydro-static precipitator types.*

AAF **American Air Filter**
COMPANY, INC.
207 Central Ave., Louisville 8, Kentucky • In Canada: Darling Bros., Ltd., Montreal, P. Q.

"BETTER MEASURE WITH LUFKIN"

NOW'S THE TIME

TO BOOST PRODUCTION . . . SAVE CRITICAL MATERIALS!



***Use* LUFKIN PRECISION TOOLS!**

The pressure is on *now*—all down the line—to boost production on one hand . . . and to reduce rejects and costly scrap on the other. Finer quality *Lufkin* precision tools can help you on this all-important job because of their many, exclusive, accuracy-assuring refinements. There is a wide selection of *Lufkin* tools available for most every precision measuring application. Now's the time to insist on nothing but the finest—*Lufkin*. See them at your industrial supply house.

103-A

Buy LUFKIN
TAPES • RULES • PRECISION TOOLS
THE LUFKIN RULE CO.
SAGINAW, MICH. • New York City • Barrie, Ont.

most accurate in the world today...

No other lathe collet chuck is as accurate as Jacobs' Spindle Nose Lathe Chuck. Extra-tight, uniform grip delivers two to four times more torque than split steel collet chucks. Designed not only for heavy-duty turning but also for chucking thin-walled tubing, plastics, wood and other fragile articles without marring, scoring, denting. Permits maximum feeds and speeds.

now...11 do the work of 88

Eleven unique Jacobs Rubber-Flex Collets do the work of 88 split steel collets and will chuck any bar from 1/16" to 1 3/8" diameter. Each collet has a capacity of a full 1/8" range. Extra long steel jaws are always parallel to and in full contact with work. Bonded together with Hycar Synthetic Rubber which will not set and is not affected by heat, coolants, cutting oils.

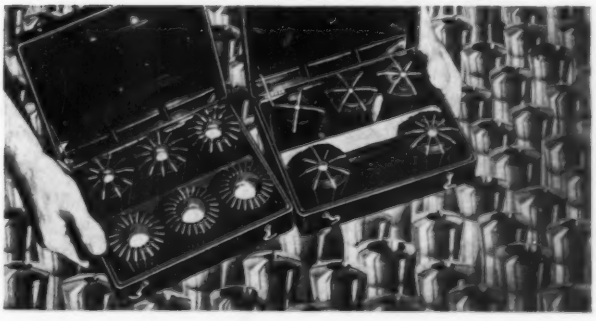
See your Industrial Distributor for Bulletin 50LC giving complete information on this amazing chuck.

The Jacobs Manufacturing Company, West Hartford 10, Connecticut.

IF IT'S A

JACOBS

IT HOLDS



Jacobs Rubber-Flex Collets are used with Jacobs Spindle Nose Lathe Chuck

DO YOU MANUFACTURE PUZZLES?

How many man hours are lost every day in your plant because metal components are not properly marked?

How much time do your customers spend trying to identify parts for reordering?

Are you losing good business because your components are not permanently and legibly marked for *instant identification?*

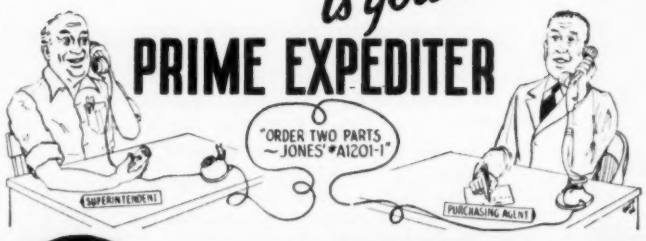
Would the use of modern marking equipment save you money?

Simply send prints or samples of parts to be marked, together with exact lettering and its location, for free recommendations.

WRITE FOR CATALOG

MARKING MACHINES — ENGRAVED STAMPING AND EMBOSSING DIES — SPECIAL MARKING TOOLS — NUMBERING HEADS — HAND STAMPS

IDENTIFICATION *is your* PRIME EXPEDITER



GTS **GEO. T. SCHMIDT, INC.**
1810 W. BELLE PLAINE AVENUE
CHICAGO • 13 • ILLINOIS

FINE CLIMATE SKILLED WORKERS

LOW COST POWER AND GAS ARE YOURS IN

EL PASO

These important factors and many others are set forth in our new industrial book. Drop us a line and we'll send you a copy; or if you have specific questions, we'll gladly answer them. El Paso is growing industrially; one reason is because the entire community welcomes new businesses.

SEND FOR THIS BOOK

WRITE:
INDUSTRIAL DEPT.
EL PASO CHAMBER OF COMMERCE
377 SAN FRANCISCO STREET
EL PASO, TEXAS
(EL PASO COUNTY BOARD OF DEVELOPMENT)

THE HORROR STORY... Or "IT CAN'T HAPPEN HERE!"

OXIDATION, REDUCTION, DECARBURIZATION AND SCALE ARE CHANCES ENOUGH TO MAKE YOU GROW PALE!
YOU'VE GOT TO KNOW HOKUS POKUS AN' STUFF - OR YOUR TOOLS'LL COME OUT ALL SOFT OR ALL ROUGH!
THOSE BIRDS TAKE US FOR A BUNCH OF FOOLS - A SIMPLE DELAWARE FURNACE TAKES CARE OF OUR TOOLS -
CONTROLLED ATMOSPHERE CAN BE SIMPLE... LIKE TURNING A KNOB, AND IN HUNDREDS OF PLANTS IT'S DOING THE JOB!
DELAWARE
SOAP

Get the FACTS on the simple DELAWARE Controlled Atmosphere Furnace. One furnace does every heat treating job on every type of tool and alloy steel. No scale... No decarburization... No hokus pokus. Send for Bulletin F-1.

DELAWARE TOOL STEEL CORP.
WILMINGTON 99, DELAWARE

after you've read this magazine

. . . and clipped pertinent ideas, articles and advertisements for reference, *please do not burn or throw it away.*

Here are two sound reasons why:

1) Wastepaper can help to swell the funds of your local Boy Scout Troop, your church or other community organization. It gets a good price these days.

2) Whether in magazine form or not, wastepaper helps to fill the increasing need for paper pulp brought on by the mobilization effort.

Collect it. Give it to your favorite organization. Chances are they have scheduled pick-ups.

Here's help for Housewives..

P-K
TRADE MARK
REG. U.S. PAT. OFF.

According to worker supply forecasts, your assembly lines will soon be "manned" by more and more housewives.

Whether housewives or not, any "green hands" on Socket Screw assembly jobs will learn faster and work faster with P-K* Size-Marked Gear Grip Socket Head Cap Screws.

The clearly readable Size-Mark prevents confusion and errors—saves a lot of lost motion. It's a help in the tool crib, too, where left-over, mixed screws can be easily sorted. And the Gear Grip means non-slip starting, speeds the job.

No wonder these time-saving, top quality Socket Screws are wanted, in tremendous quantities, for more of industry's finest products than ever before. P-K production is going 'round-the-clock to meet this mounting demand. For D.O. or other assemblies set your standards by P-K quality. Parker-Kalon Corporation, 200 Varick Street, New York 14, N. Y. Sold through Accredited Distributors.

MORE HELP FOR ASSEMBLY PLANNERS

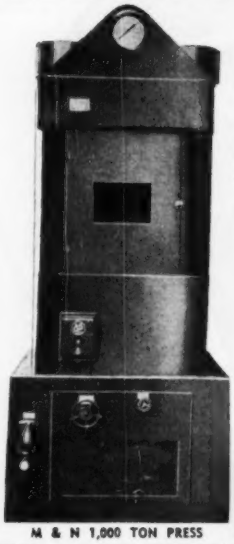
The New P-K Socket Screw Dimension Finder

A pocket-size plastic slide chart gives you all essential dimensions of P-K Socket Cap Screws, Set Screws, Flat Head Screws, Stripper Bolts, and Pipe Plugs. Includes Set Screw Point Dimensions, and Thread Length Formula. Available, FREE from your P-K Distributor.

PARKER-KALON*
cold-forged
SOCKET SCREWS

SIZE-MARKED SOCKET HEAD CAP SCREWS • GROUND THREAD SOCKET SET SCREWS
FLAT HEAD SOCKET CAP SCREWS • STRIPPER BOLTS • PIPE PLUGS • HEX KEYS
* TRADE MARKS REG. U.S. PAT. OFF.

HOBBING PRESSES
are BETTER — *BUILT BY M & N!*



M & N 1,000 TON PRESS

Capacities from 100 to 2,000 tons

1 **ECONOMICAL** Low initial cost and low operating costs make M & N Hydraulic Hobbing Presses outstanding performers in the hobbing field.

2 **COMPACT** Sturdy construction with all parts self-contained mean a minimum of floor space—the 1,000 ton press illustrated: 48" x 48"—and lower overhead charges.

3 **ENGINEERED** Built to exacting specifications, M & N presses perform like precision instruments. Quick, easy response—accurately—means *instant* hobbing action.

4 **PRODUCTIVE** Press illustrated: 21" diameter ram has a 4½" stroke; each of 4 columns is 5¾" diameter; opening is 14" high, 17" from left to right and 30" from front to rear; press is operated by 3 hp motor.

M & N Presses are outstanding in performance—outstanding in production!

Made by specialists in Hydraulic Hobbing Presses.

M & N MACHINE TOOL WORKS, INC.
299 ALLWOOD ROAD CLIFTON, N. J.

HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4070

Hinged Hammer Moulds

1, 2½ and 5 lb. sizes—order your alloy lead hammer requirements from your machine tool supply house

or direct from:

KITZMAN MFG. CO.
15410 STOEPEL AVE. DETROIT 21, MICH.

B & RB PRECISION BEARINGS

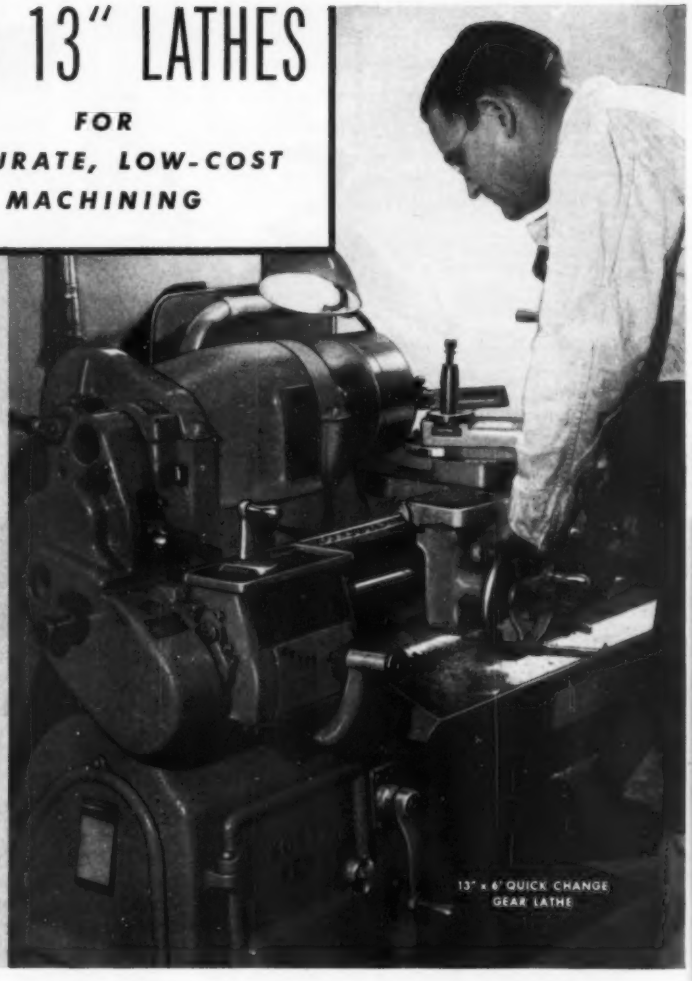
Are selected for dependability and greater capacity. Standard sizes are carried in stock.

Write for our general catalog No. 19

THE BALL AND ROLLER BEARING CO.
DANBURY, CONNECTICUT

SOUTH BEND 13" LATHES

FOR ACCURATE, LOW-COST MACHINING



SPECIFICATIONS

SWINGS: 13-1/8" over bed and saddle wings; 8-3/4" over saddle with chip guard removed

BED LENGTHS: 4, 5, 6 and 7 feet

DISTANCE BETWEEN CENTERS: 16 to 52 inches

MAXIMUM COLLET CAPACITY: 1" (Collets interchangeable with South Bend 10"—1" Collet, 14-1/2", 16", and 16-24" South Bend Lathes)

SPINDLE BORE: . . . 1-3/8 inches

SPINDLE SPEEDS: Eight . . . 40 to 940 r. p. m.

POWER LONGITUDINAL FEEDS: 48 . . . 48 R. H. or L. H., .0015" to .0841"

POWER CROSS FEEDS: 48 . . . .0006" to .0312"

THREAD CUTTING: 48 R.H. or L.H. pitches . . . . . 4 to 224 per inch

CROSS SLIDE TRAVEL: 8-1/8 in.

TAILSTOCK SET-OVER: . . 15/16"

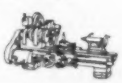
South Bend 13" Lathes are popular wherever there are a variety of precision parts to be machined. These quality-built lathes are fast and simple to operate. Set-ups and job change-overs are quickly and easily made. Maximum production at highest accuracy and lowest cost will reduce expenses in your shop. Write for complete information on South Bend Lathes and other machine tools. *Send Coupon now.*

SOUTH BEND LATHE South Bend 22, Indiana • *Building Better Tools Since 1906*

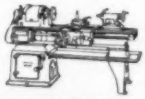
Send Information On:

☐ LATHE ATTACHMENTS

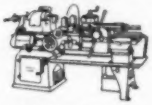
☐ 13" LATHES



☐ 9" and 10" BENCH LATHES

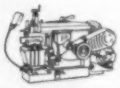


☐ 10" to 16-24" FLOOR LATHES



☐ 1/2" and 1" Collet TURRET LATHES

☐ 14" DRILL PRESSES



☐ 7" BENCH SHAPERS

Name _____ Company _____

Street _____ City & State _____

More than America spent to win its Independence

THE Revolutionary War lasted 8 years and its direct cost was $74,555,642.

This sum is considerably less than the amount Youngstown is spending on expansion--its share of the steel industry's program to help preserve America's 175-year-old freedom from Communistic attack.

Work on a $90,000,000 construction project at the Indiana Harbor Works, East Chicago, Indiana, is under way. It includes a 1500-ton blast furnace, 75 new coke ovens and 8 - 250 ton open hearth furnaces, heating furnaces, a high-lift blooming mill, with 6 - 3 hole recuperative soaking pits, ore dock extension, unloaders and ore bridge, and a vast array of other facilities needed to produce the additional 1,000,000 ingot tons of steel involved. By the end of 1952, the steel industry expansion program will raise the total steel producing capacity of the United States to over 117-million ingot tons. This is more steel than is made in all the rest of the world combined.

This tremendous investment by the shareholders of private industry is possible only with adequate profit--profit earned in the past and to be earned in the future. This is a symbol of public confidence--confidence that the American system of free enterprise is right *and worth saving.* Confidence that it will continue to be our way of life through the years ahead.

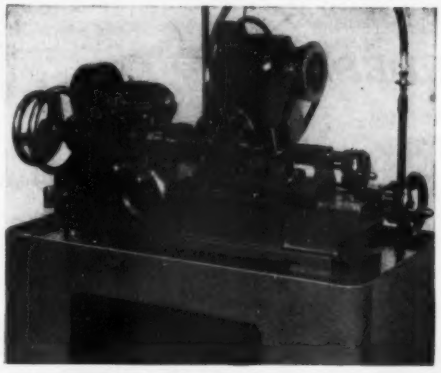
Scrap Metal is Critical Again

The Youngstown Sheet and Tube Company

General Offices--Youngstown 1, Ohio
Export Offices--500 Fifth Avenue, New York

MANUFACTURERS OF CARBON ALLOY AND YOLOY STEELS

The steel industry is using all its resources to produce more steel, but it needs your help and needs it now. Turn in your scrap, through your regular sources, at the earliest possible moment.



WALTHAM THREAD MILLING MACHINES

. . . for producing accurate, fine-finish threads on small diameters at low cost

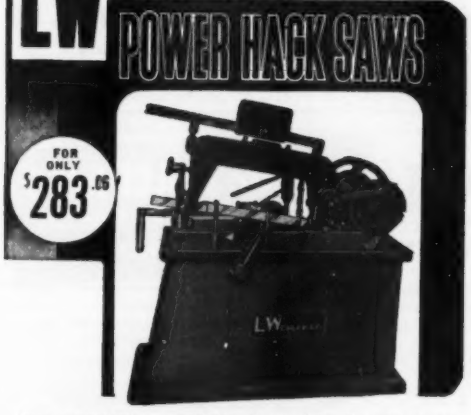
This NEW model is mounted on a welded steel base in which are accessibly located control panel, coolant motor and pump. It is equipped with separate motors for cutter, work and coolant. Motor push buttons are conveniently placed.

Swing over carriage is 3" and work 2" diameter or smaller can be handled. Threads 8¾" long can be cut with work held on centers. Special attachments are available for extending the utility of this machine. *Illustrated literature available on request.*

WALTHAM MACHINE WORKS
HIGH STREET WALTHAM, MASS.

IT HAS BEEN DONE!
WE ARE PRODUCING HIGH SPEED

LW POWER HACK SAWS



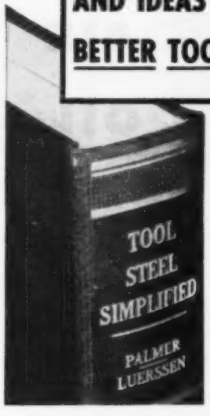
Stops automatically on completion of cut. Automatic relief of saw blade on non-cutting stroke. 6" x 6" capacity using 10" x 14" blades. 12" x 3" clutch pulley. Pulley speed 120 r.p.m. Coolant pump base. Swivel vise for angle cuts. All steel welded base and table. V-belt drive. Rigid frame. Gravity feed. Length gauge. Expanding clutch. 3-speed (90 to 130 r.p.m.) V-belt motor drive arrangement, $29.31, less motors. ½ H.P. 1725 r.p.m. motor recommended. Completely Motorized with Switch; Single Phase $375.74; Three Phase $382.53.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY 25 SO. ST. CLAIR ST. TOLEDO 4, OHIO

why does one shop consistently produce good tools and dies . . . while another runs into periodic trouble? . . . *this book gives*

ALL INFORMATION, METHODS, AND IDEAS NEEDED TO PRODUCE BETTER TOOLS AND DIES



Practical Data on Popular Analyses of Tool Steels, their Selection, Heat Treatment, and Use

in the Revised, Enlarged SIXTEENTH PRINTING of this

TOOL and DIE STEEL HANDBOOK

By Palmer and Luerssen

Here's the BOOK OF ANSWERS for every man responsible for tools and dies. Shows you how to increase your company's production from present equipment—how to reduce toolmaking trial and error, conserve tool steel, avoid die troubles, simplify heat treatment. It starts "from the beginning" with *what* tool steels are, their analyses, and why one grade will outperform another on some jobs. Gives complete working information on everything from selection of the right steel to heat treating methods and equipment, hardness and toughness testing, latest data on high speed and hot work steels. 564 pages, 355 charts, photos, diagrams give you facts on: how design affects heat treatment, hardenability tests, time required to heat different tools to required hardening and drawing temperatures, furnace atmospheres, quenching, tempering, trouble-shooting.

PLUS 80-PAGE TOOL AND DIE STEEL SELECTOR

All arranged alphabetically to put your finger on the one steel that will give best results. Use this book to train new men—its logical step-by-step presentation gives apprentices thorough basic training—gives skilled men new, modern methods and techniques.

OVER 100,000 COPIES IN USE!
CLIP AND MAIL NOW

THE CARPENTER STEEL CO. • READING, PA. • DEPT. 1X-1

Please send me, postpaid, your revised "Tool Steel Simplified". I enclose $2.00 ($2.50 outside U. S. A.) in full payment of the book.

NAME_____ TITLE_____

FIRM NAME_____

MAILING ADDRESS_____

CITY_____ STATE_____

(Please Print)

Tell Us Your Production Problems . . . We'll Help You Solve Them

"LOGAN" AIR-DRAULIC® FEED-CONTROLLED CYLINDERS

• Power Movements In Any Direction • No Power Unit Required

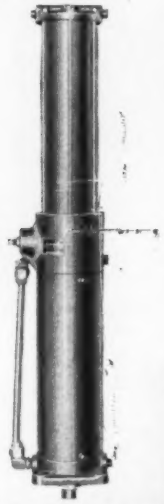
Combines

the fast-acting, economical, low pressure operation of **AIR**

with the smooth, uniform controlled regulation of **OIL**

5 STANDARD MOUNTING TYPES • Standard bores from 3" to 8". Any stroke to 5 ft. For air pressures to 150 p.s.i.

Furnished for controlled feed with rapid return in either direction, or with controlled feed in both directions. Skip feed movement can also be provided.



FLUID POWER SPECIALISTS SINCE 1916

Logan Manufactures 6,975 Standard Cataloged Items

Free Catalog On Request

- AIR CONTROL VALVES — CATALOG 100-4
- AIR CHUCKS — CATALOG 70-1
- AIR CYLINDERS — CATALOG 100-1
- AIR and HYDRAULIC PRESSES — CATALOG 51
- COLLET GRIP TUBE FITTINGS — CATALOG 44
- HYDRAULIC CONTROL VALVES — CATALOG 200-4
- HYDRAULIC CYLINDERS — CATALOG 200-2; ALSO 80-2
- HYDRAULIC POWER UNITS — CATALOG 200-1
- SURE-FLOW COOLANT PUMPS — CATALOG 62

Let Logan Engineers help you design your Air and Hydraulic Circuits.

Logan SAVES • TIME • EFFORT • MOTION

Air and Hydraulic Equipment

LOGANSPORT MACHINE CO., INC. 818 Center Ave. Logansport, Ind.

LUERS Patented Cutting Off Tool Holders, Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips MEANS MAXIMUM CUTTING EFFICIENCY

Manufactured By J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.

Produced under License Issued by John Milton Luers Patents Inc.

POPE PRECISION SPINDLES

For Grinding, Boring, Milling and Drilling

POPE MACHINERY CORPORATION · Haverhill, Mass.

Builders of Precision Spindles Since 1920

HENRY & WRIGHT

DIVISION OF HARTFORD-EMPIRE COMPANY

HARTFORD 5, CONNECTICUT

DIEING MACHINES

(HIGH SPEED AUTOMATIC PRESSES)

HIGHEST SPEEDS — LONGEST DIE LIFE

---

your ONE source for ALL centers

RED-E CENTERS

ANTI-FRICTION • HIGH SPEED CARBIDE TIPPED

RED-E is the *only* preferred *complete* line of Superaccurate Precision Centers that meet the exact requirements for Defense Production. When trouble free, efficient operation is a factor . . . choose a Red-E Center! Write for literature.

for Lathes, Grinders, Spinning, Milling, Railroads and Gear Cutting Machines.

CENTER *Specialists Since* 1908

RED-E TOOLS

READY TOOL COMPANY

548 Iranistan Ave. Bridgeport 5, Conn.

NEW

Metal Ful-Vue Safety Goggle

It also Flatters the Features while

PROTECTING THE EYES!

You expect protection in a safety goggle and you certainly get it in the new, strongly constructed AO F 4100 Safety Goggle with its 6 curve super armorplate lenses, new eyewire, rugged endpieces, double braced bridge and other quality features. But what's more, it's protection that workers are glad to wear because this goggle is good looking as well as functional. Your nearest AO Safety Products Representative can supply it — with or without side shields.

QUICK FACTS

(5 NEW CONSTRUCTION FEATURES)

- **EYEWIRE** — Light but long-lasting. Flat edges instead of round, deep grooves hold lenses securely. Beaded engraving on some models.
- **ENDPIECE** — Wide bearing surface at hinge minimizes temple drop. Screw heads flush with endpieces can't snag — add to appearance.
- **TEMPLES** — Lightweight, oval-shaped, easily-adjusted, perspiration proof. Insulated brown half tubing can't discolor. Temple and endpiece screws AO "Evertite".
- **GUARD ARMS AND BRIDGE** — Longer and newly shaped for easier adjustment; bridge is doubly braced.
- **SIDE SHIELDS** — One-piece binder and eyewire save time — screen does not have to be inserted before lenses. Orbit-shaped lenses replace easily without interference from shields.

American Optical

SAFETY PRODUCTS DIVISION

Southbridge, Massachusetts • Branches in Principal Cities

your best vise value
by far

Non-pinching Type Handle: One-piece. No ends to come loose.
Stands Heavy Blows: Step milled jaw inserts have shoulder to take heaviest vertical as well as horizontal blows, easy to replace when necessary.
Steel-Slide: Exclusive Desmond-Simplex all-steel slide, milled "from the solid"—guaranteed* not to break or bend in service.
Holds Larger Work Securely: Stronger slide permits greater jaw capacities—greater work holding capacity.
Easier Lubrication: Screw retainer is outside for instant lubrication of screw.
Extra-heavy Body Casting is semi-steel.
Minimum Backlash: New longer, stronger main vise nut will last indefinitely.
Full 360 degree Swivel Base: Extra heavy, locks in any position.

A life-time guarantee against defects due to faulty workmanship or materials stands behind every Desmond-Simplex Heavy Duty Vise. No other vise gives you all these features. No other vise gives you such a guarantee. No other vise gives you better long-run economy. Write Desmond-Simplex on your next vise orders (to leading industrial distributors) and you'll get the best. . . . THE DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Desmond
SIMPLEX STEEL SLIDE VISES

Walker Magnetic Chucks
Hold Everything

Standard Electro and Permanent Magnetic Chucks . . . Vacuum Chucks . . . Special Applications for various holding problems . . . Demagnetizers . . . Magnetic Clutches.

O. S. WALKER CO. Inc.
WORCESTER 6, MASSACHUSETTS
Original Designers - Builders of Magnetic Chucks

Severance CUTTING TOOLS HIGH SPEED CARBIDE

MIDGET MILLS - ¼" Shanks
GROUND-from-the-Solid

TEN LEADERS
MORE THAN 20 SHAPES—EACH IN SEVERAL SIZES
Obtain the best from the originator of GROUND-from-the-Solid

DEBURRING GROUP
30° 45° INSIDE
30° 45° OUTSIDE
HAND RADIUS

Severance JUNIOR MILLS-⅛"Shanks
GROUND-from-the-Solid

SET OF TEN

Practical for use on small grinders, for finishing Patterns, Dies, Parts, etc., in places difficult to reach with the larger Mills.

HIGH SPEED and CARBIDE

ACTUAL SIZE

TUBING GROUP
STANDARD Chamfering
SOLID (For Endless Lips)

Truly REVOLUTIONARY Cutting Tools

Severance LAB MILLS—$\frac{1}{32}$" Shanks
GROUND-from-the-Solid

These speedy Mills for Dental Laboratories find many uses in Jewelry and in Die and Mold making. Available in 10 popular shapes in 4 or more sizes each, for the finest cutting and finishing. May be reground up to 8 times per $\frac{1}{32}$" reduction in diameter.

ACTUAL SIZE

Write for Catalog No. 18

HIGH SPEED Out-Pattern Dental Burs and Grinding Points

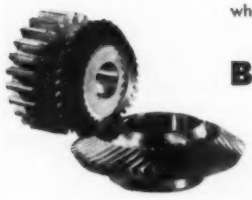
COUNTERSINK GROUP
STANDARD
HEAVY DUTY
BALL SEAT REAMER

Complete REGRINDING Service — by New Tool Craftsmen
— Savings are thus multiplied —

SEVERANCE TOOL INDUSTRIES, INC.
726 Iowa Ave. Saginaw, Mich.

CONTROL in the manufacture of gears is, we think,
a matter of complete control . . . control of every operation.

- At BRAD FOOTE we have complete control of each step from the inception of the original design to the delivery of the finished gears you use. For here . . . in our own plant . . . we design, engineer, machine, heat-treat, test, inspect, clean, and finish every gear. No one shares our responsibility.
- Our control guarantees the quality of BRAD FOOTE gears . . . gives you assurance that the gears you buy will perform satisfactorily when used in your shop . . . or on the equipment you sell to others.



BRAD FOOTE GEAR WORKS, Inc.

BIshop 2-1070 • OLympic 2-7700 • 1309 South Cicero Avenue
Cicero 50, Illinois

fits *smoothly* into your production picture . . .

Cincinnati Gears, Good Gears Only!

Spur
Helical
Rack
Worm
Bevel
Spline Shafts
Spiral
Internal
*Coniflex
Herringbone
Spiral Bevel

*Reg. U. S. Pat. Off.

Maximum performance and dependability are two qualities that are absolutely essential in gears for any industrial purpose.

Where performance must be "RIGHT", you may select *Cincinnati Gears, Good Gears Only*, with complete confidence in their ability to do a good job.

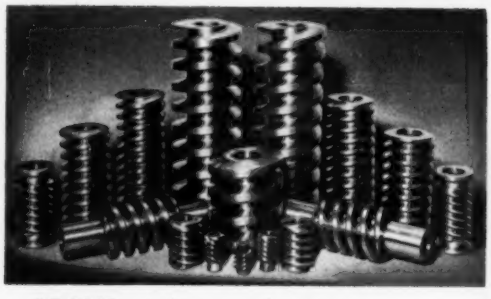
THE CINCINNATI GEAR COMPANY
"Gears Good Gears Only"
Wooster Pike and Mariemont Ave. • Cincinnati 27, Ohio

GEARS and PINIONS to help put *Punch* IN YOUR PUNCH PRESS OPERATIONS

Precision-machined and cut, these continuous-tooth Herringbone gears and pinions are ready for a long, productive life in constant, heavy duty use. Stahl specializes in producing gears like these, economically and on time, to meet your exact specifications. For any type gear, in any size or quantity, get Stahl's estimate first.

SPURS TO 72" PD, 1 DP
BEVELS TO 54" PD, 1 DP
SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP
CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP
SPROCKETS TO 72" PD, 2½" CP
RACKS TO 20 FT. LONG, 3 DP
SILENT GEARS; RAWHIDE, BAKELITE, FABROIL
HEAT-TREATED, CASE OR FLAME HARDENED GEARS – OF CARBON OR ALLOY STEEL

Stahl
GEAR & MACHINE COMPANY
3901 Hamilton Ave. Cleveland 14, Ohio



ADAMS custom made gears

While your product is still on the boards, plan on using Adams precision-made gears. Built by craftsmen . . . exactly as specified.

the ADAMS line . . .

SPUR GEARS	INTERNAL GEARS (Spur and Helical)	SHAVED TOOTH GEARS (Spur and Helical)
BEVEL AND MITER GEARS	RATCHETS	
WORMS AND WORM GEARS	SPLINED SHAFTS	GROUND THREAD WORMS
SPROCKETS	LEAD AND FEED SCREWS	RACKS

The ADAMS Compa
Dubuque, Iowa, U. S. A.
ESTABLISHED 1883

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS

BUZZER *Gas Fired* FURNACES

NO BLOWER OR POWER NEEDED . . . *just connect to gas supply*

Here's speed, economy and lifetime service in this most efficient and economical soldering and general purpose bench furnace. This #22 furnace heats a pair of 12 lb. soldering coppers in 8 minutes. Can be used for melting lead, heating small tools, etc. Since 1911 BUZZER Soldering Furnaces have been the equipment of thousands of industrial plants, shops and schools.

Write today for catalog showing various types of furnaces, burners and other equipment.

CHARLES A. HONES, INC.
121 South Grand Avenue, Baldwin, L. I., N. Y.

MP QUALITY GEARS CUT TO ORDER MP

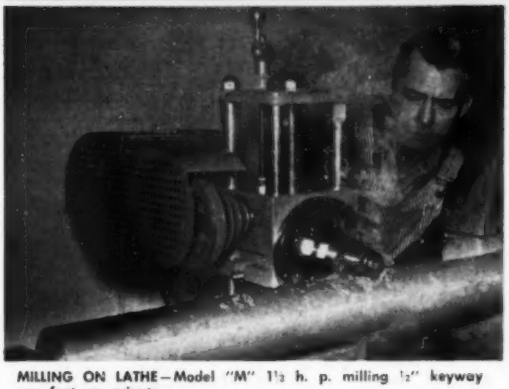
• MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MP MEISEL PRESS MFG. CO. MP
946 Dorchester Avenue Boston, Mass.

NEW MASTER MILLING ATTACHMENTS

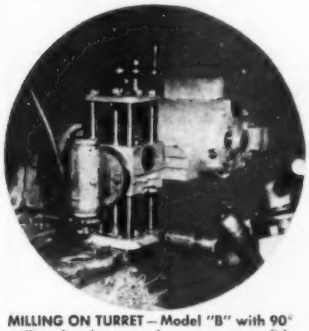
FOR PRODUCTION – TOOL ROOM – EXPERIMENTAL AND MAINTENANCE SHOPS

MODELS–FEATURES

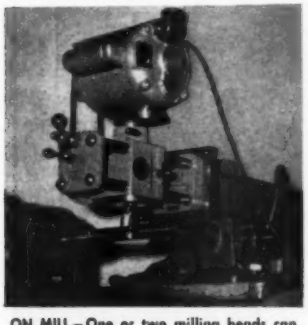


MILLING ON LATHE – Model "M" 1½ h. p. milling ½" keyway one foot per minute.

ON LATHES TURRETS AND MILLING MACHINES



MILLING ON TURRET – Model "B" with 90° milling head mounted on rear cross-slide for keyways, slots, cross milling – completing part in turret.



ON MILL – One or two milling heads can be used on post assembly for single or multiple milling cuts. Mounts on overarm for vertical milling or cross-ways for opposed milling head.

Master MACHINE TOOLS

BASIC MILLING UNIT

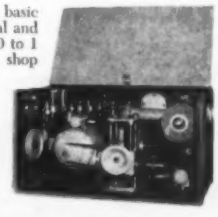
3 SIZES • CAPACITIES

Model "C" – ⅓ h. p. motor – 9" to 13" swing lathes
Model "B" – ½ or ¾ h. p. motor – 14" to 18" swing lathes
Model "M" – 1 or 1½ h. p. motor – 18" to 72" swing lathes

The Master Lathe Converter is a precision multi-purpose machine tool attachment adaptable on most all basic shop machines. The basic unit does milling, drilling, boring, and has eight interchangeable heads for milling, drilling, grinding, slotting, keyseating, and indexing. Spindle speeds, 50 to 15,000 rpm. It provides complete machining facilities with minimum equipment investment, produces more operations per set-up thus increasing production of your present equipment, saves work transfer, assures accuracy, is simple and fast to set up. Prime and subcontractors are converting their present equipment for special applications and production with the multi-purpose Master Lathe Converter.

COMPLETE SHOP KIT

COMPLETE SHOP KIT – This group of equipment includes basic milling unit, external and internal grinding heads, 90° universal and hi-speed milling heads, slotting or internal keyseating head, 40 to 1 geared dividing head, seven arbors, in a heavy plywood shop cabinet. This kit provides facilities for most all machine shop operations on a lathe at a fraction of the investment required for individual machines, plus wide use on other basic shop machines. Ideal for maintenance and repair, tool room, experimental, mobile units, aboard ship, and production shops.



★ MILLING ★ DRILLING ★ BORING
★ THREAD MILLING ★ GRINDING
★ SLOTTING ★ INDEXING
★ INTERNAL KEYSEATING

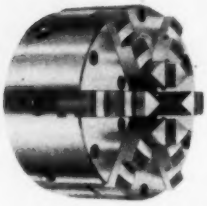
WRITE FOR FREE LITERATURE

MASTER MANUFACTURING CO.
1322 EAST AVENUE A
HUTCHINSON, KANSAS U. S. A.

Buck ADJUST-TRU CHUCKS

6 Jaw Chuck Handles Work of 93 Collets!

Scroll chuck speed— with .0005 precision



HOW IT WORKS

One pinion (shown in center of chuck body) moves jaws in or out to grip work like any scroll chuck. 4 opposed screws work on the chuck adapter to bring work to dead center. Once set dead true, you can machine hundreds of duplicate parts without changing adjustment. Inexperienced men have centered work within .0005 in 3 minutes!

It's unbelievable—but TRUE. *This one 6" chuck will do the work of 93 collets!* Spindle capacity is from ⅛" to 1½" by .001. Step collet capacity from ⅛" to 5" by .001. In addition, you get the firm grip of 6 jaws, minimum overhang, *and .0005 precision with scroll chuck re-chucking speed.* All this at ordinary scroll chuck cost!

It ends most needs for stub arbors and mandrels. It can be used on dividing heads, grinders, screw machines, lathes. Few, if any, developments of recent years have done so much to save machinists time. Send for literature—see for yourself.

BUCK TOOL CO.
410 Schippers Lane
Kalamazoo, Mich.

DO YOU NEED HELP?

If you are in need of technical executives from Works Managers to Supervisors, an ad in the Classified Section of *American Machinist* will help you locate the men you need.

•

Low Rates
for either display or undisplayed copy.

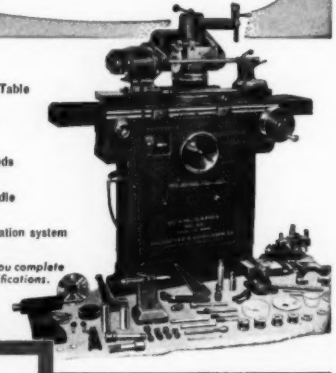
•

WRITE - PHONE - WIRE
Classified Advertising Division

American Machinist
330 West 42nd St.
New York 18, N. Y.

FOR SHARPENING . . .
- Milling cutters
- Gear cutters and reamers

GRAND RAPIDS No. 60
Universal cutter and tool grinder



Features:
- Anti-Friction Bearing Table
- Four Spindle Speeds
- Two Work-Head Speeds
- Greased-for-Life Spindle
- Bijur, one-shot lubrication system

Your letter will bring you complete information and specifications.

GALLMEYER & LIVINGSTON COMPANY

GRAND RAPIDS GRINDERS
330 Straight Ave., S.W., Grand Rapids 4, Michigan

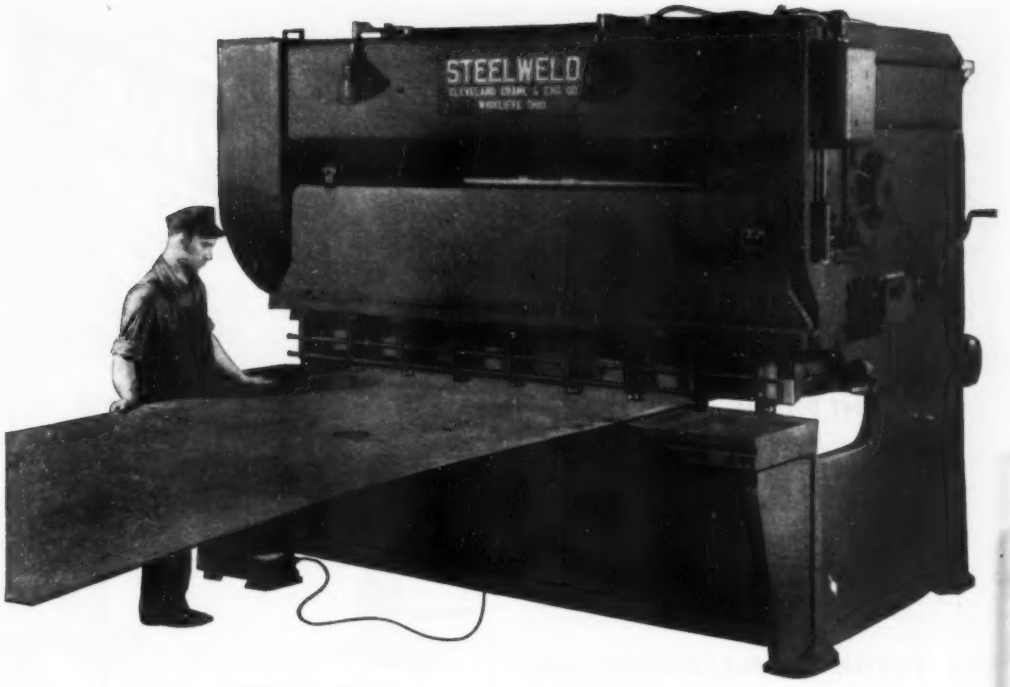
KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.
Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.



ALL STEELWELD SHEARS
CONTROLLED ELECTRICALLY...

OPERATION of Steelweld Shears is unusually easy and convenient. There is no tiresome lifting of the leg to work a foot treadle. Slow, fatiguing knee action has been replaced by fast easy toe action.

A safety type electric foot switch is used. It can be slid around the floor wherever most convenient. It enables shearing speeds not attainable with foot treadles for certain cutting operations.

For instance, when cutting narrow strips from a long sheet, the operator can push the sheet at the end and control the shear at the same time. He need not be near the machine. As the sheet becomes shorter he can move the switch along with his foot to always be within easy reach.

There is no extra charge for electrical foot control on Steelweld Shears — it is standard equipment on all size machines.

Steelweld Shears are radically different from all other shears with many outstanding features. Get the facts on these truly new and modern machines. Learn about the advantages they offer you.

GET THIS BOOK!

CATALOG No. 2011 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1403 EAST 282nd ST. *WICKLIFFE, OHIO*

STEELWELD PIVOTED BLADE SHEARS

BETTER CHECK...

RUTHMAN GUSHER
MACHINE TOOL COOLANT PUMPS

Gusher Coolant Pumps give you everything you're looking for in a coolant pump.

Split-second coolant control, from a trickle to full volume with no packing or priming needed, helps you raise production on your machines.

Simple yet sturdy construction with dynamically balanced rotating parts assures you of long trouble-free life.

Heavy-duty pre-lubricated ball bearings which require no further lubrication or attention cuts maintenance costs to a minimum.

Follow the leading machine tool manufacturers—specify Gusher Coolant Pumps on your metal-cutting machinery.

THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

Precision Die Made—Lowest Possible Cost.
DAYTON ROGERS MFG. CO., Minneapolis 7, Minnesota

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

RIVETT PRECISION TOOLROOM LATHES AND GRINDERS

SEE FULL PAGE ADVERTISEMENTS opposite "Backlash" in American Machinist describing **10" Toolroom Lathe** (9-4-50; 11-27-50; 2-19-51; 4-16-51); **9" x 18" Plain Cabinet Lathe** (1-22-51); **9" Swing Hand Turret Lathe** (10-2-50; 5-14-51); **8½" x 20" Instrument Lathe** (3-19-51); **10" x 24" Universal Hydraulic Grinder** (10-30-50; 12-25-50; 2-19-51).

For Complete informative literature on the entire line of Rivett lathes and grinders, write to

Dept. AMM-4, **RIVETT LATHE & GRINDER, Inc.,** Brighton 35, Boston, Mass.

FERRACUTE PRESSES
Complete line. Mechanical power presses 32 to 500 tons. Since 1863.
FERRACUTE MACHINE CO., *Bridgeton, N. J.*

EISLER JIG BORING • CAMS

A SPECIALIZED CAM MILLING SERVICE ROWBOTTOM . . JIG BORING . . SPOT WELDING . . CONTRACT PRODUCTION . . EXPERIMENTAL DEVELOPMENT

EISLER ENGINEERING CO., Inc.
738 SOUTH [illegible] ST. NEWARK [illegible] N. J. U.S.A.

A complete three stage STAMPING

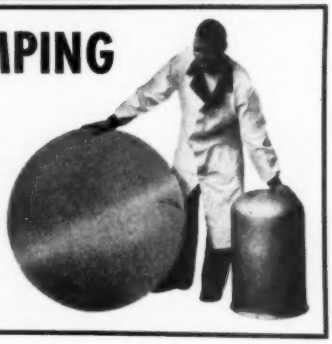
The work shown illustrates the drawing of a half-tank section 14⅝ inches in diameter and 24 inches deep from a 38½ inch blank 0.105-inch thick. These half-tank sections can be produced by the Schnell continuous process at the rate of one completed section in 18 seconds.

This ingenious process turns out a finished shell of better metallurgical properties in that there is less metal distortion and a pronounced absence of thinning resulting in a more uniform wall thickness. Thus you get a better product, in less time at lower cost.

IN 18 SECONDS

★

Write for full descriptive bulletin or consult us direct on your deep drawing problems.



SCHNELL TOOL & DIE CORP. — Salem, Ohio

FIGHT WASTE

IN PEACE WASTE IS A SIN...
NOW...WASTE IS A CRIME!

DISSTON
Announces a New
WASTE PREVENTION PLAN
for increasing productive efficiency

In the face of growing shortages of tools, materials, and manpower, American industry is daily receiving new demands for higher and still higher production . . .

NOW COMES THIS NEW DISSTON PLAN TO HELP YOU GET MORE OUT OF YOUR TOOLS, MATERIALS, AND MANPOWER—TO HELP YOU INCREASE PRODUCTION, CUT MANUFACTURING COSTS—BY STOPPING WASTE!

DISSTON GIVES YOU THE PLAN READY TO USE!

The foundation of this "Fight Waste" program lies in educating workers to use tools properly. For this purpose, Disston will supply you—without cost or obligation—with individual instruction cards containing specific facts on the most efficient use and care of the cutting tools listed below. Use of these cards simplifies and multiplies supervision, speeds training of new and unskilled men, helps make the most productive use of time, effort, and equipment! You also get complete instructions on how to distribute the cards in your plant.

ORDER THESE CARDS IN ANY QUANTITIES:

- **No. 1** *Power Hack Saw Blades*
- **No. 2** *Hand Hack Saw Blades*
- **No. 3** *Milling Saws*—Circular High Temper
- **No. 4** *Fast Running Metal Saws*—Circular—Medium and Mild Temper
- **No. 5** *Carboloy Saws*
- **No. 6** *Carboloy Knives, Cutters, Etc.*
- **No. 7** *Flexible Back Metal Band Saws*
- **No. 8** *Inserted Tooth Circular Metal Saws*
- **No. 9** *General Information on Files*
- **No. 10** *Saw Files*
- **No. 11** *Machinists' Files*
- **No. 12** *Special Purpose and Wood Working Files*
- **No. 13** *Superfine Swiss Pattern Files*
- **No. 14** *"Rights and Wrongs"* in Refitting Circular Saws
- **No. 15** *Wide Band Saws—Log Mill Saws*
- **No. 16** *Narrow Wood Cutting Band Saws*
- **No. 17** *Dado Cutters*
- **No. 18** *Solid Tooth Circular Wood Cutting Saws*—Flat Ground—Rip and Cross-Cut
- **No. 19** *Circular Wood Cutting Combination Saws*—Hollow Ground—Raker Tooth Type
- **No. 20** *Circular Wood Cutting Combination Saw*—Flat Ground—Raker Tooth Type
- **No. 21** *Solid Tooth Circular Edger Saws*
- **No. 22** *Solid Tooth Circular Trimmer Saws*—Flat Ground
- **No. 23** *Narrow Band Saws for Cutting Plastics*
- **No. 24** *Solid Tooth Circular Plastic Saws*—Hollow Ground
- **No. 25** *Circular Knives*
- **No. 26** *Paper Knives*
- **No. 27** *Thin Planer Knives*
- **No. 28** *Heavy Planer Knives*
- **No. 29** *Veneer Knives—Rotary and Slicer*
- **No. 30** *Chipper Knives*
- **No. 31** *Cutter Heads*—Circular, Generated and Straight Knife Types

ALSO: "The Pocket Foreman"—a complete manual for the use of foremen and other supervisory workers on how to FIGHT WASTE in their departments—how to boost the productivity of their men. Contains a complete set of "Fight Waste" Cards as a guide in ordering.

GET COMPLETE DETAILS

Your Disston distributor will gladly give you information on applying this plan in your plant—help you determine your needs for "Fight Waste" material. Consult him or write Disston direct.

HENRY DISSTON & SONS, INC. 420 TACONY, PHILADELPHIA 35, PA., U.S.A.

MECHANICAL ENGINEERS' HANDBOOK

Just Published

1. **Provides practical data in every branch of mechanical engineering—from aeronautics to mechanical refrigeration,** from power generation to welding, from metal-cutting machines to hoisting and conveying. New material in this 5th edition includes fluid mechanics, aircraft jet propulsion, plastics, industrial supersonics, atomic power, rocket fuels, and many more. **Edited by Lionel S. Marks, Gordon McKay Prof. of Mechanical Engin., Emeritus, Harvard Univ. 5th Ed., over 2200 pages, 1500 illus., $15.00**

PRESSWORKING OF METALS

Just Published

2. **A valuable reference for the design of press tools and the fabrication of metals in power presses.** Includes over 1000 press tool designs, types of presses, attachments and pressroom accessories and tells how to use them in die engineering practice. Tells how to simplify presswork, cut costs, save material, perform difficult operations and improve results. Profusely illustrated treatment shows how to select presses, etc. etc. **Second Ed. By C. W. Hinman, Former Chief of Jig and Fixture Design, Western Elec. Co., Chicago. 543 pages, 524 illus., $8.50**

OXYGEN CUTTING

Just Published

3. **Tells how to use the oxygen cutting process most efficiently in its varied applications.** Discusses the equipment and techniques used, pointing up new and valuable applications for the process. Covers flame machining, underwater cutting, rock drilling, electronic tracers for cutting machines, etc. **By George V. Slottman, Dir. of Research and Eng'ring, and Edward H. Roper, Asst. Tech. Sales Mgr., both of the Air Reduction Sales Co. 395 pages, 91 illus., $6.50**

MACHINABILITY AND MACHINING OF METALS

Just Published

4. **Explains the metallurgy and machining characteristics of the various metals and their alloys**—shows how to select the proper material and process it to give the most efficient machining to the finished product. Discusses tool design, cutting, speed, feeds, types of cutting fluids, etc.; tells where to use special practices or tools. **By Norman E. Woldman, Consulting Metallurgical Engin., and Robert C. Gibbons, Metallurgical Engin., Bendix Aviation Corp., 578 pages, 198 illus., $7.50**

THE SELECTION AND HARDENING OF TOOL STEELS

Just Published

5. **A systematic guide to the selection of tool steels, giving analyses of 960 steels arranged in terms of their toughness and wear resistance.** Classifies tool steels into groups and subgroups, giving a quick, easy method for finding the steel that fits your job requirements. Includes material on heat treating. **By L. H. Seabright, Research Dir., Vulcan Stamping and Mfg. Co. 263 pages, 70 illus., $5.00**

Send No Money • Mail Coupon Today

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., New York 18, N. Y.

Send me book(s) corresponding to numbers encircled below for 10 days' examination on approval. In 10 days I will remit for book(s) I keep, plus a few cents for delivery, and return unwanted book(s) postpaid. (We pay for delivery if you remit with this coupon; same return privilege.)

1 2 3 4 5

Name .....

Address .....

City ..... Zone ..... State .....

Company .....

Position AM-4-2-51

This offer applies to U.S. only.

DRILLING PROBLEMS?

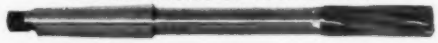
Call Production Drilling Headquarters for expert know-how. There's a Leland-Gifford office near you.

LELAND-GIFFORD COMPANY
Worcester, Mass.

CHICAGO 6, ILL.
565 W. Washington Blvd.
DETROIT 26, MICH.
1553 Dime Bank Bldg.
CLEVELAND 1, OHIO
P. O. Box 5547
NEWARK 2, N. J.
Industrial Office Bldg.
ROCHESTER 1, N. Y.
Commerce Bldg.
LOS ANGELES 14, CAL.
724 South Spring Street

ATTENTION REAMER BUYERS

70 YEARS CHOICE OF TOOL EXPERTS



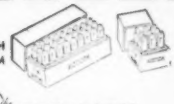
REAMERS, MILLING CUTTERS, END MILLS, SPECIALS

ALVORD-POLK TOOL CO. Millersburg, Pa.

TOUGH STEEL STAMPS

WE KNOW THEY'RE TOUGH BECAUSE WE MAKE THEM THAT WAY.

● This is the kind of Stamps your Tool Makers and Machinists keep under lock and key.



The ACROMARK Company

7-13 MORRELL ST., ELIZABETH 4, N. J.

WANTED *Most* FOR HIGH ACCURACY STAMPING OPERATIONS

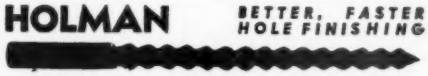
V&O LONG SLIDE *Precision* **POWER PRESSES**

Available in sizes from 3 to 105-ton capacity.
Write for Catalog

THE V&O PRESS COMPANY
DIVISION OF HARTFORD-EMPIRE COMPANY
Builders of Precision POWER PRESSES and FEEDS
Since 1889 HUDSON, N.Y.

HOLMAN

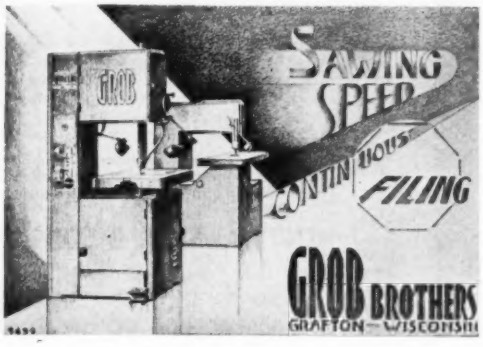
BETTER, FASTER HOLE FINISHING



HELICAL TAPER PIN REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
MANCHESTER, CONN.



Available to Everyone---

.000004 of an inch

Remember the first gage blocks? So costly that their use and storage was a carefully supervised operation.

That was more than 30 years ago.

During that period, Webber worked out a method that eventually brought the cost down to a point where even the smallest shop could afford to use them.

Now .000004 of an inch accuracy is a common measuring tool in every shop.

To a larger degree it is the precision afforded by the gage block that has made mass production possible and the Webber organization is proud of the part it played. The Webber Gage Co., 12901 Triskett Rd., Cleveland 11, Ohio.

Write for your copy of a new Webber catalog that tells how gage blocks are made and how Webber Gage Blocks achieve their dimensional accuracy.

Webber

MICRO-ACCURATE GAGE BLOCKS & FIXTURES

LARGEST EXCLUSIVE MANUFACTURERS OF GAGE BLOCKS

Are you equipped TO HOLD YOUR JOB— TO GET A NEW ONE?

IT WORKS in the metal working field as well as in any other. Some men fit themselves to do a little more than their job calls for. They fit themselves to do a little more than the other fellow. They make a steady effort to equip themselves with the best kind of a job insurance there is—KNOWLEDGE.

How about you? Do you know how quickly knowledge will pile up—how quickly you will become more valuable—if you spend a few minutes a day, regularly, studying sound books like the American Machinists' Library? Do you know how easily it can be managed paying only a few cents a day, while you use the books?

Thousands of men have followed this plan to win advancement or to make their jobs safe. You can too. Read about this Library and our 10 Day Examination Offer. Then send the attached coupon to us today.

New, Completely Revised and Enlarged

AMERICAN MACHINISTS' LIBRARY

6 VOLUMES 2987 PAGES OVER 2900 ILLUSTRATIONS

The library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It fully explains lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, jigs, and fixtures, punch and die work, metal surfacing, etc. All plainly written and fully illustrated.

6 OUTSTANDING BOOKS

1. ***TURNING AND BORING PRACTICE—3rd Edit.***
Gives the essential principles involved in turning and boring operations . . . a picture of the kinds of machines in use and methods of operating them.

2. ***DRILLING AND SURFACING PRACTICE—3rd Edit.***
Useful information on drilling and surfacing tools, the machines in which they are used, and the methods of use which give best results.

3. ***GRINDING PRACTICE —3rd Edit.***
How to use the right machine and method for each operation. New data added on the use of diamond abrasive wheels for cutting-off work, complete details on speed, wheel selection, precision grinding, etc.

4. ***GEAR CUTTING PRACTICE —3rd Edit.***
Machines and methods for making gearing of different kinds and for checking accuracy. Includes standards adopted by the American Standards Association and the American Gear Manufacturing Association.

5. ***PUNCHES AND DIES —4th Edit.***
Outlines development of die design; discusses use of metal stampings for complicated constructions, sectional dies and big press work, blanking operations, etc.

6. ***JIGS AND FIXTURES —5th Edit.***
Explains the design and use of jigs and fixtures. Contains drawings of over 600 pieces available for adaptation. Emphasizes machines used, new standards for jig bushings, etc.

FREE

(for mailing the enclosed free examination card now)
The valuable Fred Colvin book

STARTING A SMALL MACHINE SHOP

. . . covering the problems and situations you're apt to meet in starting and managing a small shop. Proven tips on locating and laying out your shop —on selecting equipment —on handling the work and employees, etc., can guide you to success in your own machine shop. **This 222-page illustrated manual, regularly priced $3.00, yours FREE under this offer.**

NO MONEY DOWN EASY PAYMENTS

Let us send you this up-to-date Library for 10 days' examination with no obligation to buy the books unless you want them. After 10 days, if you decide to keep the library, send $3.50 as the first installment and $4.00 monthly until $27.50 is paid. Otherwise return the set under no obligation. You may keep Colvin's valuable book whether or not you purchase the library.

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., N. Y. 18
Send me the American Machinists' Library, 6 volumes for 10 days' free trial. In 10 days I will either return books or send $3.50; then $4.00 a month until the special price of $27.50 has been paid. With my shipment I will receive FREE a copy of **Starting A Small Machine Shop**—which I may keep whether or not I buy the library.

Name .....
Address .....
City ..... Zone ..... State .....
Company .....
Position A-4-2-51

This offer applies to U.S. only.

RANDALL and STICKNEY
Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.
This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005-in. or .01 mm. Has a ½-in. range movable dial easily set at zero.
The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.
There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St.
Waltham 54, Mass., U.S.A.
Makers of Dial Gauges Since 1885

D. A. Stuart Oil Co.

2729 SOUTH TROY STREET CHICAGO 23, ILL.

Cutting Fluids and Lubricants

Famous for

- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on Page 207 Mar 19 1951 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Pacific Coast Representative: *A. C. Berringer 234 N. San Pedro St., Los Angeles, California.* Canada: *F. F. Barber Machinery Co., Toronto, Canada.*

CENTERING
MACHINES

• HAND • SEMI AUTOMATIC • AUTOMATIC

Special Machinery

HEBERT Equipment Co. • Romeo, Mich.

Reprinted again by request:

DISASTER CONTROL

Send for your copies: 50¢ each

Reader Service Dept. American Machinist

"ROCKWELL" HARDNESS TESTER

Made Only by Wilson

• Development and improvement of "ROCKWELL" Hardness Testers over the years have made "ROCKWELL" scales the universal standard of hardness. A reading on the "ROCKWELL," the "ROCKWELL" Superficial or the "TUKON" Tester is the same in any language.

WILSON MECHANICAL INSTRUMENT CO., INC. ACCO

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE

230-8 PARK AVENUE, NEW YORK 17, N. Y.

for DC Heliwelding

Your best bet is AIRCO THOR-TUNG ELECTRODES

Here's a tungsten electrode that's especially designed for all positions on straight polarity, DC Heliwelding on stainless steel, copper, mild steel and aluminum, using Heliwelding, Airco's inert gas arc welding process. Made with thoriated tungsten, long-noted for its excellent electron emission characteristics, Airco Thor-Tung offers these advantages —

IT DOESN'T MELT . . .

Airco Thor-Tung does not "ball up" at the end of the electrode nor does it sputter off into the puddle when subjected to high arc welding temperatures — because of its cool operating characteristics, longer life is obtained from each electrode.

NO CONTAMINATION . . .

Airco Thor-Tung permits the operator to "touch-start" directly on the work without contaminating the work or the electrode. Uncontaminated electrodes increase production and result in better welds.

EXCELLENT ARC STABILITY . . .

One of the keys to consistent weld quality and ease of operation is good arc stability. With Airco Thor-Tung, the arc is very stable and does not wander or climb up the electrode even at low currents. Touch starting is made easy even with currents as low as 15 Amperes. The better stability of these electrodes enables a given size to be used over a wider range of currents.

ECONOMICAL . . .

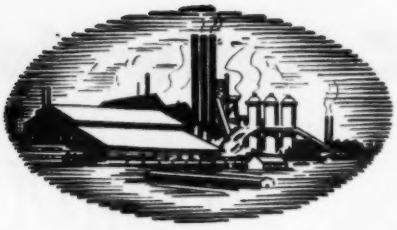
Thor-Tung's permanency, ease of operation and stability make it the most economical electrode for straight polarity, DC Heliwelding.

For full information about Airco Thor-Tung, write your nearby Airco office today.

AIRCO

AIR REDUCTION

AIR REDUCTION SALES COMPANY . AIR REDUCTION MAGNOLIA COMPANY
AIR REDUCTION PACIFIC COMPANY
REPRESENTED INTERNATIONALLY BY AIRCO COMPANY INTERNATIONAL
Divisions of Air Reduction Company, Incorporated
Offices in Principal Cities



1900 ★ THE MIRACLE OF AMERICA ★ 1950

Freedom and Progress

It's no stretch of the imagination, rather, robust realism to call our past half century a Miracle—U. S. A.

America has set an amazing record of progress in 50 years—but a moment in the history of civilization. A record unequalled by any other political or economic system.

Merely by broad brush strokes, we can all visualize this miracle. Remember the crystal set, the hand-cranked car, the biplane? A far cry from our FM radio, television, hydro-matic drive and supersonic planes.

And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

- Since 1900 we have increased our supply of machine power 4½ times.
- Since 1900 we have more than doubled the output each of us produces for every hour we work.
- Since 1900 we have increased our annual income from less than $2400 per household to about $4000 (in dollars of the same purchasing power), yet . . .
- Since 1900 we have cut 18 hours from our average work week—equivalent to two present average workdays.

How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

THIS IS THE MIRACLE OF AMERICA . . . it's only beginning to unfold.

A PUBLIC SERVICE PROJECT ★ THE ADVERTISING COUNCIL ★

Published in the public interest by:

McGraw-Hill Publications

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

$1.20 per line, minimum 4 lines. To figure advance payment count 5 average words as a line.

EMPLOYMENT WANTED and Individual Selling Opportunity undisplayed rate is one-half of above rate, payable in advance.

PROPOSALS $1.20 a line an insertion.

INFORMATION

BOX NUMBERS count 1 line additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).
EQUIPMENT WANTED OR FOR SALE Advertisements acceptable only in Displayed Style.

DISPLAYED RATE

The advertising rate is $10.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches to a page. A.M.

NEW ADVERTISING received by 10 A.M. April 3rd will appear in the issue of April 16th subject to limitation of space available

REPLIES (Box No.):
Address to office nearest you
NEW YORK: 330 W. 42 St. (18)
CHICAGO: 520 N. Michigan Ave., (11)
SAN FRANCISCO: 68 Post St. (4)

EMPLOYMENT SERVICE

SALARIED POSITIONS $3,500 to $35,000. We offer the original personal employment service (established 41 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered; present position protected. Ask for particulars. R. W. Bixby, Inc., 266 Dun Bldg., Buffalo 2, N. Y.

SELLING OPPORTUNITY OFFERED

MACHINE TOOL Salesman, experience necessary, prefer young man having practical machine shop, designing and engineering experience. Excellent opportunity in New York Eastern Territory. Write details to SW-9094, American Machinist.

CONTRACT WORK AVAILABLE

Prominent New York City

Manufacturer has large amount of Tool Work and Machine Work to sublet. Please send your Facility List of equipment to CWA-9215, American Machinist.

PATENT ATTORNEY

Patent Practice

before U.S. Patent Office. Validity and infringement investigations and opinions. Booklet and form "Evidence of Conception" forwarded upon request. Lancaster, Allwine and Rommel, Registered Patent Attorneys. Suite 453, 815 15th Street, N. W., Washington 5, D. C.

Consult: Z. H. Polachek

Reg. Patent Attorney 1234 Broadway, New York 1, N. Y.

Well-known Swedish manufacturer of high class grinding machines and precision tools is looking for an agent in the state of New York. Reply to

"North-East District"
GUMAELIUS ADVERTISING
Stockholm, Sweden

WANTED

WANTED
HENRY & WRIGHT DIEING PRESSES
10 to 100 Ton Cap.
Also Steel Sheets, Strip Steel Coils
Please send lists
W-7377, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

Manufacturer wants to Purchase the following machines not over 10 years old.
Profilers. Milling Machines #3, #4, #5. Horizontal and Vertical Gorton 9 ft. 1 Spindle Cincinnati Hydrotel. Lathe up to 36" Swing and Short Centers.

W-9035, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

ENGINEER WANTED

Progressive Pacific Northwest manufacturer seeking qualified *pressed metals manufacturing engineer* for permanent position. Must have well-rounded background of practical experience, including die making or design, press or machine shop experience, and a general knowledge of mechanical engineering problems. Prefer graduate engineer. No age requirements. Must be capable of filling semi-supervisory position, working with both shopmen and engineers on advanced techniques of product design and improved manufacturing procedures. Opportunity unlimited. Reply giving complete qualifications.

P-9140, AMERICAN MACHINIST
68 Post St., San Francisco 4, Calif.

POSITIONS OPEN

ENGINEERS: Immediate openings are available to several young (25-27) single, mechanical, technical or metallurgical engineers with sales aptitude. Opportunity to work directly with the head of established manufacturer of chemicals and equipment in customer and prospect contact and service. Give complete information including training and experience. Employment will be east of the Mississippi River.

THE A. F. HOLDEN COMPANY
11300 Schaefer Highway, Detroit 27, Michigan

MACHINE DESIGNERS WANTED

by large Industrial and Building Products manufacturer. Experience in automatic and semi-automatic industrial process and production machine design necessary. Age 26 to 55. College degree or equivalent. Send resumé and salary requirements. All replies kept confidential.

P-9294, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

J. L. OVERHOLT
WABASH EMPLOYMENT AGENCY
202 South State Street
Chicago 4, Illinois WABASH—6820

Specializes in placing all types of draftsmen, designers, engineers, technical men and executives.

Write for full information today.

The DU PONT Co. Wants MANAGEMENT ENGINEERS

. . . must be graduate of Mechanical, Chemical or Industrial Engineering, with 3 to 12 years experience in any one of the following: Office Methods, Work Simplification, Wage Incentive, Craft Measurement or Statistical Analysis. Must be willing to travel.

Give experience, education, age, references, personal history, salary received and salary expected. Please be complete & specific.

—

All Inquiries Will be Considered Promptly & Kept Confidential

E. I. du Pont de Nemours & Co.
ENGINEERING DEPARTMENT
WILMINGTON, DEL.

DESIGN AND DEVELOPMENT ENGINEER

With Slip Spindle Drill Head Experience

Leading Detroit machine tool manufacturer has opening for design engineer with a thorough knowledge of adjustable slip spindle drill heads. Exceptional opportunity for a man with sufficient background and ability.

P-9264, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

ROCKET SHELLS!!

If you plan to manufacture Rocket Shells
—WE OWN AND HAVE FOR SALE—

One—Davis & Thompson Roto-Matic Continuous Automatic 20 h.p. eight spindle drill, tooled for drilling 5" rocket shells.

Model 8-LV—completely rebuilt with clamping fixtures, bushing plate, etc. Variable feed and fully adjustable. Available for immediate delivery and can be inspected under power—*outstanding value.*

Write or Call:—

LURIA BROTHERS & COMPANY, INC.
LINCOLN-LIBERTY BLDG. RITTENHOUSE 6-7455 PHILADELPHIA 7, PA.

CONTRACT WORK

WANTED
METAL STAMPING
CONTRACT WORK

Arrow Safety Device Co.—a well-established, well-located company now engaged primarily in the manufacture of automotive lighting and safety lighting devices—is interested in submitting bids on metal stampings, the finishing of any metal work, and assembly work.

In addition to welding, plating and polishing equipment, Arrow has 30 presses, varying in capacity from 10 to 140 tons. Skilled personnel include tool and die makers, platers, polishers, press operators, shearer operators, drill operators, spray painters, spot welders, assemblers (including metal and electrical components). Our engineering and design department is sufficiently large and experienced to furnish valuable assistance in the development of a finished product. Our purchasing department has had extensive experience in obtaining a wide range of diversified materials.

We are presently engaged in the subcontracting of metal stamping—including everything from kitchen stools to electronic devices. In most cases, the dies are made in our own tool room.

Arrow is located on a branch of the Pennsylvania Railroad only 18 miles from industrial Philadelphia, with easy access to motor transport service to and from Philadelphia and Trenton.

Write or wire
CONTRACT DEPARTMENT
ARROW SAFETY DEVICE COMPANY
MOUNT HOLLY, NEW JERSEY

1—#3 LeBlond H.D. Miller
1—#2 B&S Vertical Miller
1—#4 Cincinnati Vertical Miller
1—10 Ton Henry & Wright Dieing Press —1945
1—14"x6' Hendey Yoke Head Lathe
1—16"x8' Hendey Yoke Head Lathe
1—18"x6' Hendey Yoke Head Lathe
1—20" Hendey Shaper
1—24" Gould & Eberhart Shaper
1—8' Perkins Press Brake
1—5' 12" Col. Radial Drill Cinn. Bickford
1—4' 11" Col. American Radial Drill
1—Thompson Gibb Butt Welder 100 KVA 440 V.

HAYDEN MACHINERY
P.O. Box 127 Wallingford, Conn.

READY TO SHIP
some of
'Rice's' Guaranteed Tools

Turret Lathes—1" to 9" capacity
Ironworkers & Punches
Engine Lathes—10" to 82" Swing
Production Lathes—Leblon 17" Rapid Production
Shapers—7" to 28" Ram & Planer Type
Drills—#1 MT to #5 MT, single to 4 Spdle.
Boring Machines—Horiz. & vert.

Plus all other types of machine tool equipment. Machines as late as 1948. Give us your requirements and let us quote you.

WE NEED YOUR IDLE MACHINES
ONE MACHINE OR COMPLETE PLANT.
HIGHEST CASH PRICES PAID

MONA

ROBERT W. RICE & CO., INC.
"Chicago's Machinery Exchange"
212 S. Clinton St., Chicago 6, Ill.
Financial 6-0782

WANTED

Manufacturer wishes to Purchase the following machines not over 10 years old.
Pratt & Whitney Die Sinkers
Simplex Milling Machines Rise & Fall Tracer Controls
Milling Machines with Turchan or Detroit Duplicator Control.

W-9118, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

MACHINERY FOR SALE

#4-36 Cincinnati

DUPLEX MILLING MACHINE

in new condition.

FAIRFIELD EQUIPMENT CO.
100 Sanford St. at R.R. Station FAIRFIELD, CONN.

WANTED—D.O. WORK ONLY

Stamping and Drawing to 30 Tons
Spinning — Spot Welding to 30 K.V.A.
Buffing — Lacquering — Shearing
Soldering — Contour Sawing — Brass and Alum Sand Casting
Batch Type Alum Annealing

HAMPTON ROADS MFG. CO.
HAMPTON, VA.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us - we will take care of them.
GENERAL PATTERN WORKS
2233 Beck Street Cincinnati, Ohio

WANTED TO BUY

1—Double End Automatic chamfering machine for chamfering ends of small diameter bushings.

STRIPMATIC PRODUCTS INC.
2132 West 15th St., Cleveland 13, Ohio

AVAILABLE

MODEL GCJ, RED RING GEAR SHAVER, Serial #583, New 1942; Capacity O.D. 4" to 36".

GENERAL SALES AND SERVICE
First National Bank Bldg., Peoria 2, Ill.

PUT YOUR IDLE CAPACITY TO WORK

Hundreds of metal-working companies are finding profitable business today outside their regular lines. Tell metal-working America—the 100,000 readers of AMERICAN MACHINIST—about your facilities. Write for rates.

Contract Work Section
AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED

Whiton Bevel Gear Cutting Machines. Bevel Gear Milling Machines for cutting 12 Pitch to 7 Pitch Gears.

W-9200, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

FOR SALE
General Machine Shop

Job and manufacturing, located in Southwestern West Virginia....Price $100,000.00

BO-9247, AMERICAN MACHINIST
330 W. 42 St., New York 18, N. Y.

BUY FROM STOCK
Telephone
BAKER 5887

FALK
MACHINERY COMPANY

10 WARD ST.
ROCHESTER 5
N. Y.

Every Item Guaranteed as Represented

AUTOMATIC, #0 B & S Auto. Cut-Off 11/16" Cap.
AUTOMATIC, Nat-Acme #C, 5-Spdl. 9/16".
AUTOMATIC, B&S Wire Feed. 1".
AUTOMATIC, B & S #2G. 1".
AUTOMATIC, #53 Acme-Gridley 4-Spdle. 1" Cap. Lot of collets, cams, pads, gears. Thrd. spindle and Die Head. 5 h.p. 3/60/220/440 volts.
BORING MILL, Colburn 60" Vert. Two Hds.
BORING MILL, Giskolt 42" Vert. 220/440 volts.
BORING MILL, Lucas #31 Horiz. 3" Bar.
BORING MILL, Giddings & L #0 Horiz. 3" Bar.
BORING MILL, Giddings & L #32 Horiz. 3½" Bar.
BORING MILL, Ryerson #11 Horz. 3" Cap. #6 M.T.
BORING MILL, Barrett #2 Horiz. Cyl. Borer, 5".
BORING MILL, King 42" Three Head Vertical. A.C. Motor Dr. Power Rapid Traverse to each head.
Sommer & Adams #20A Boring, Hobbing & Threading Machine. Timken Bearings. Swings 36" over bed. 18" cross feed, 42" longit. Carriage has rapid approach & return. Used to mill internal threads. Excellent Condition.
BORING MILL, 61" Bullard MAXI-MILL 2 Hds.
BORING MILL, #0 Giddings & Lewis, 3½" Bar.
#5 M.T. 220/440 volts. TWO.
VERT. MILL, Linley High Speed Jig Borer & Miller. 8-Speeds, 275 to 4250 r.p.m. w/indicators & measuring rods.
BOREMATIC, Heald #49 Sglo. End. W/Univ. Fixture. 220/440 volts.
BROACH, Oilgear 10 Tons Horiz. 56" Str.
BUFFER & POLISHER, Divine #VMT5 Dble. End.
BUFFER & POLISHER, U. S. Electrical Multi-Speed Double End #95, 5 h.p., 220 volts.
SGLE. SPDLE. DRILL, Fosdick 16" Sleg. Hd. #2.
SGLE. SPDLE. DRILL, Barnes 24", #4 M.T.
SGLE. SPDLE. DRILL, Buffalo #2MS. 26" #3 M.T.
SGLE. SPDLE. DRILL, Aurora 30" Brdg. #5 M.T.
SGLE. SPDLE. DRILL, Colburn #2 Mfg. #4 M.T.
RADIAL DRILL, Fosdick 5' Arm, 14" Col. #5 M.T.
RADIAL DRILL, Carlton 4'-15". Motor Dr.
TWO SPDLE. DRILL, Leland Gifford 28". #2 M.T.
DRILL, Radial, Cinci-Bick. 5' Arm, 13" Col. #5 M.T. 24 speed gearbox. 7½ h.p. 3/60/220.
DRILL, Deep Hole, Avey-Draulic #2 Sgle. Spdle.
DRILL, Deep Hole, Pratt Whitney #2 Four Speed Gun Barrel & Tube Drilling Machine. Drills 72" long, 3" diameter. M. Drive.
DRILL, Baker #314 Hvy. Pattern High Speed Vertical Boring & Drilling Machine, 7½ h.p. 220/440 motor, #5 taper, 12 feeds, 6 speeds, 12¼" thread, 3" Capacity in steel.
TWO SPDLE. DRILL, Leland Gifford 26", #2 M.T.
TWO SPDLE. DRILL, Leland Gifford #2LMS 20". #2 M.T. 11" o.c. 220 volts motors.
DRILL, Avey-Matic #3 Hvy. 2-Spdl. #3 M.T. 24".
3—SPDLE. DRILL, Leland Gifford #2 MS—14", 11"
3—SPDLE. DRILL, Edlund #2B, #2 M.T. 18", 9½"
DRILL, L. Giffords #2MS 14", 11" C.C. 3-Spdle.
4—SPDLE. DRILL, Leland Gifford 26". #2 M.T. 11"
4—SPDLE. DRILL, Demco #KT. #2 M.T. 24".
6—SPDLE. DRILL, Leland Gifford 14", #2 M.T.
DRILL, Cincinnati 21" Brdg. Drilling & Tapping.
DRILL, Natco #12 Multiple Spindle Motor Driven. #1 taper, 3 h.p. 220/440 motor. Arranged for 18 spindles. Rectangular head, with Natco 24" Rotary Table.
BASE PITCH & SPACE MEASURING MACHINE. #337 Illinois. Late Type—Like New. Capacity—12" diameter gear, 15" between centers. Full Set of Off-Set and Straight Contact Fingers, Dial Indicator Tailstocks and Leatherette Cover.
DISC GRINDER, Besley #205—18" Dble. End Motor Driven. 220/440 volts. Wet or Dry.
SURFACE GRINDER, Horiz. Leach 6"x12" Hand.
GRINDER, Cylindrical, Brown & Sharpe #2 Universal. 220/440 motors.

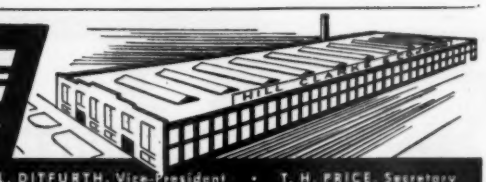
PARTIAL LISTING OF LARGEST STOCK IN THIS AREA

GRINDER, Hammond #14W Carbide, Dble. End.
GRINDER, Heald #22 Surface, 12" chuck.
GRINDER, Oakley #3 Univ. Tool & Cutter.
GRINDER, Abrasive #33 Vertical Surface.
GRINDER, Sellers #1A Hvy. Duty Tool.
GRINDER, G & L #4 Univ. Tool & Cutter.
GRINDER, Landis 10x24 Univ. Hydr. Cylindrical.
GRINDER, Heald #25 Surface, 12" Chuck.
GRINDER, Cam, Landis 5"x40" "Type D" Hydraulic Semi-Automatic. New in 1942. Slight use, like new.
GRINDER, Cylindrical, Norton 10"x24" Hydraulic
GRINDER, Cylindrical, B & Sharpe #4 Univ.
GRINDER, Cylindrical, B & Sharpe #10. 6x18.
GRINDER, Cylindrical, Cinci. 6x18 Hydraulic.
THREAD GRINDER, J & Lamson #TG-615 Automatic. Late Type.
GRINDER, Blanchard #16, 26" Chuck Vert. Rotary.
GRINDER, Landis Crank 10x32 Hydraulic.
GRINDER, Brown & Sharpe #2 Auto. Horiz. Surface.
GRINDER, Cincinnati #EA, 10" x 36" Hydraulic Cylindrical, Filmatic Bearings, 220 volts motors. Built-in electrics. Hydraulic infeed.
GRINDER, Heald #72A-3 Size-Matic Internal.
GRINDER, Norton 6 x 18 Hydraulic Vert. Rotary Auto. Excello Spdle. 220 volts.
GRINDER, Norton 6 x 18 Hydraulic Horiz. Surface. Excello Spdl. 220 volts.
GRINDER, Pratt Whitney 22" Vert. Rotary. 84" table travel.
GRINDER, Greenfield #12 Internal Hydromatic. 220/440 V.
GRINDER, Heald #70 Internal.
GRINDER, Pratt Whitney 14x36 Vert. Rotary.
GEAR HOBBER, B & S #34 Spur. 18" dia.

Hilles & Jones #6 Pyramid Type Motor Driven Plate Bending Rolls. Size—14'x¾". Top roll —22" dia. Lower rolls—15" dia. Immediate delivery.

GEAR SHAPER, Fellows #6 High Speed.
GEAR SHAPER, Fellows #72 High Speed.
GEAR SHAPER, Fellows #62 High Speed.
GEAR SHAPER, Fellows #7 High Speed.
HAMMER, Riveting, High Speed. All Sizes, motor driven.
HAMMER, Bradley 200# Rubber Cushioned Helve, 225 to 240 blows per minute.
HEADER, Manville #1 S.S.S.D. Cold, 3/16".
KEYSEATER, Mitts & Merrill #3 Giant Motor Driven, 220 440 volts motor. Capacity—24" long, 3" wide keyway. Automatic Feed.
LATHE, Pond 36"x108" Grd. Hd. With Equip.
LATHE, 32"x16' Bridgeford Q.C.G. Grd. Hd.
LATHE, Niles 30"x30' Grd. Hd. With Equip.
LATHE, 20"x72" Sidney 'Mono-Trol'. Taper Att. Etc.
LATHE, 26"x18' Bridgeford Q.C.G. Grd. Hd.
LATHE, Bridgeford 26"x14' Q.C.G. 5'5" C.C. 220 volts two speed motor.
LATHE, 24"x8' Lodge Shipley, Hvy. Duty.
LATHE, 24"x14' LeBlond Q.C.G. Grd. Hd.
LATHE, 20"x10' American Q.C.G. 72" c.c.
LATHE, 20"x10' Hendey Q.C.G. Taper Att.
LATHE, Reed-Prentice 20"x60" Grd. Hd.
LATHE, 20"x8' Lodge & Shipley Q.C.G.
LATHE, 18"x8' Lodge Shipley Q.C.G. Gr. Hd.
LATHE, 18"x10' American Q.C.G. Grd. Hd.
LATHE, 18"x6' American Q.C.G. Grd. Hd.
LATHE, 16"x6' LeBlond Q.C.G. Taper Attach.
LATHE, 16"x6' Lodge Shipley Q.C.G. Grd. Hd.
LATHE, 14"x8' Hendey Q.C.G. Taper Attach.
LATHE, 14"x6' Hendey Q.C.G. Taper Attach.
LATHE, 14"x6' LeBlond Q.C.G. 220 volts.
LATHE, 12"x5' Hendey Q.C.G. Taper Attach.
LATHE, 10"x24" Logan #820 Q.C.G. NEW
LATHE, 9"x15" Porter-Cable Grd. Hd. Production.
LATHE, 8"x108" Fitchburg Automatic Production.
LATHES, Turret #4 W & S Univ. 1½".
LATHES, Turret, #2 Simmons Grd. Hd. 1".
LATHES, TURRET, Bardons & Oliver #1 Electric Bar Feed ⅝" cap. Collets, Rd. Sq. Hx. 220 volts.
MILL & SHAPER, Cochrane & Bly #14 Univ. Duplex Vertical.
MILL, Van Norman #2SP Horiz. 220 volts.
MILLING MACHINE, Vert. #3 Cinci. High Power.
MILLING Machines, Vert. #4 Cinci. High Power.
MILLING Machine, Horiz. #2, #3, #4, #5 High Power. 220/440 Motors.
MILLING Machine, Horiz. #3 Kempsmith Univer.
MILLING Machine, Horiz. #4 LeBlond Univ. Hvy.
MILLING Maghine, Horiz. #1½ B & Sharpe Univ.
MILLING Machine, Horiz. #2 Kempsmith Univ.
MILLING Machine, Horiz. #2 B & Sharpe Univ.
MILLING Machine, Horiz. #3 B & Sharpe Univ.
MILLING Machine, Duplex. Cochrane-Bly #14 Univ.
MILLING Machine, Duplex, Van Norman #2.
MILLING Machine, Cincin. #4—36 Plain Hydmatic.
MILLING Machine, Prod. #1—18 Cinci. Hor. Auto.
MILLING Machine, Prod. #0—8 Cinci. Vertical.
MILLING Machine, Prod. #0—8 Cinci. Auto. Horiz.
MILLING Machine, Production, #12 B&S 18".
MILLING Machine, Prod. #12 B&S 24" Late Type.
MILLING Machine, Horiz. K&T #2B Dble. Overarm. 220/440.
MILLING Machine, Horiz. Nichol- 'tand Millers.
MILLING Machine, Cincinnati Vertical #3 N.S. Dial Type. W/Rotary Table.
MILLING Machine, U. S. #MMI-8 Cam Controlled Automatic Horizontal, #40 taper, Late Type. 220/440 motors. TWO.
THREAD MILLER, Pratt & Whitney #1105. 6x14 cap. 220/440 volts.
THREAD MILLER, Hanson Whitney 4"x8" Univ. Semi-Automatic.
THREAD MILLER, Lees Bradner #40A Automatic Chucking. 220/440 v.
THREAD MILLER, Pian-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, #40 Spdl. Timken Bearing. THY-MO-TROL Control Unit. 5 h.p.
PIPE THREADER, Williams #3, 1½" to 6".
BOLT THREADER, Hill-Acme #1½-C Sgle. Hd.
TAPPER & THREADER, W & S #11R Dual Radial. Motor and Tooling.
TAPPER, W & S #1 Sgle. Spdle.
POWER PRESS, Bliss #164 Open Back S.S.S.A. 65 tons, 4" Stroke.
POWER PRESS, Bliss #84 S.S.S.A. 56 tons, 10" Stroke, 20" between uprights.
POWER PRESS, Bliss #3A S.S. Dble. Crank S.A. Grd. 45 tons, 4" stroke, 36" between uprights.
POWER PRESS — Bliss - Consolidated #163 - B Straight Side Dble. Crank Single Action, 45 tons, 6" stroke, Bed area—24" x 41", 15 h.p. 220 motor.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Federal #2 O.B.I. 2" Stro.
PRESS, Federal #3 O.B.I. Grd. 4" Stro.
PRESS Federal #4 O.B.I. Grd. 3" Stro.
CUT-OFF SAW, Yates-American #M-90. 220/440.
SAW, Band, Tannewitz #GH-36" High Speed.
SHAPER, Vert., Pratt Whitney #B—6" Motor Dr.
SHAPER—Columbia 32" B.G. Crank.
SHEAR, Squaring, Wysong & Miles #572-A 6'x 14 ga. All gauges & 220/440 motor.
SHEAR, Quickwork #A-1 Rotary 60" Throat. 18 ga.
WELDER, Federal #712 AT Motor Driven Toggle Action Projection. New in 1936. 200 KVA. 10" throat. Stroke—1" to 3". With controls.
WELDER, Federal #624B Hvy. Duty Grd. Type 75 KVA 1½" Stroke. 12" throat. Motor driven.

HILL-CLARKE MACHINERY COMPANY



ESTABLISHED 1867 • H. W. MONS, President • W. L. DITFURTH, Vice-President • T. H. PRICE, Secretary

DRILLS
1 Spdl—26" Sw—No. 2 LMS L.G. Hyd.
2 Spdl—24" Sw—No. 2 Aveymatic
3 Spdl—15" Sw—No. 2—MA 6—Avey
4 Spdl—24" Sw—No. 3 Avey
6 Spdl—14" Sw—No. 2 LMS L.G. Hyd.

GEAR MACHINES
No. 61-A Fellows Gear Shaper (1942)
No. 7 Fellows Gear Shaper (1942)
No. 72 Fellows Gear Shaper
11" Gleason Bevel Gear Generator
12" Gleason Bevel Gear Generator
No. 13 Brown & Sharpe Spur & Bevel
No. 1 Whiton Auto. Gear Cutter
No. 6 Gleason Bevel Gear Tester (1942)
No. 2—36" Schuchardt & Schutte

BORING MACHINES
3" Bar Universal Horizontal Boring
Rockford—3½" Bar
34" King Vert. Bor. Mill
42" Bullard New Era
42" King

GRINDERS
6"x18" Norton Type C Plain (1943)
6"x30" Norton Type C Plain (1943)
10"x72" Landis Type C Hydraulic
Hill-Clarke Norton Type Motor Driven Grinders
10"x36" centers
10"x50" centers
10"x72" centers
10"x96" centers
14"x36" centers
14"x72" centers
14"x120" centers
16"-40" gap x 120" centers
18"x96" centers
18"-30" Gap x 96" centers
20"x96" centers
23"x36" centers
24"-32" Gap x 144" centers
No. 34 Abrasive Surface Grinder (1943)
No. 22—12" Heald Surf. Gdr.
No. 25-A Heald Surface Grinder
No. 104 Rivett Internal Gdr. (1943)
No. 72-A-3 Heald Internal (1942)
No. 72-A-5 Heald Internal (1942)
No. 72-A-5 Heald Extended Bridge Internal
No. 16-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 81 Heald Centerless Internal

LATHES
Model R-14 Seneca Falls Lo-Swing

MILLING MACHINES
No. 3 Cincinnati H.P. Universal
No. 3B Milwaukee Plain
No. 4 Cincinnati H.P. Plain
No. 5 Cincinnati H.P. Plain
No. 08 Cincinnati Plain
No. 08 Cincinnati Vert.
No. 2½-B Milwaukee Vert
No. 2—18" Sundstrand-Electromil (1942)
No. 2—24" Sundstrand-Electromil (1942)
No. 4—48 Cincinnati Hyd.—2 Vert. Hds.
No. 4-48 Cincinnati Hyd. Tracer (1942)
No. 45-48 Cin. Hyd. Tracer (1941)
4"x9" Hanson Whitney Thrd. Mill
6"x36" Lees-Bradner—Model LT (1943)
6"x80" Pratt & Whitney Thrd. Mill
6"x132" Pratt & Whitney Thrd. Mill
6"x180" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney Thread (1942)
10"x60" Pratt & Whitney Thrd. Mill
12"x54" H.T. Lees-Bradner Thread Miller (1943)
48"x24"x12' Ingersoll Slab Miller. 4 Hds.

MISCELLANEOUS
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
18" Newton Slotter
10"x10" Rassmussen Saw, Stock Fd.
4" Toledo Pipe Machine (1944)
No. 0 Bakewell Tapper
Baush Radial Tapper
No. 307 Barnes Hone
Model H-7 Micromatic Vert,. Hone, 1 Spdl.
Model 200 Micromatic Horiz. Hone, 1 Spdl.
Model H-2 Micromatic Horiz. Hone, 2 Spdl.
14' Niles-Bement-Pond Roll

PLANERS
36"x36"x12' Cincinnati, 2 hds.
36"x36"x12' Gray, 2 Hds.
42"x42"x10' Cincinnati 2 hds.
48"x36"x14' Gray
48"x48"x12' Cincinnati, 4 Heads

C-3

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

SCARCE MACHINE TOOLS

No. 2-24 Cincinnati R & F Automatic Mill (1946)
No. 3H Kearney & Trecker Mill, late
No. 2H Kearney & Trecker Mill, late
No. 08 Cincinnati R & F Automatic Mill, late
No. 1-12 Cincinnati Plain Automatic Mill, late
No. 10 Brown & Sharpe Automatic Mill, late
10"x18" Landis Hy. Plain Grinder, late
No. 2 Brown & Sharpe Universal Grinders, late (2)
No. 5 U Foster Turret Lathe
No. 4A Warner & Swasey G.H. Turret Lathe, ser. 292,000
No. 5 Bardons & Oliver Turret Lathe, serial 14063
12"x63" Fay Automatic Lathe, 1940
R-14 Seneca Falls Lo-Swing Aut. Prd. Lathe, 1940
8½"x8" Goss & deLeeuw Chucker
18"-17½"x84" Porter McLeod Engine Lathes, late (2)
No. 16A Gorton Swiss Type Automatic, late
4½" Model A Cleveland Automatic
No. 00, No. 0, No. 2 Brown & Sharpe H.S. Automatics
No. 262 Barnes G.H. Drill Press, late
No. 8 Marvel 18"x18" Metal Band Saw, late

MACHINE TOOLS

TELEPHONE TAylor 9-8200
LAKE MACHINERY COMPANY
942 WEST LAKE STREET • CHICAGO 7, ILLINOIS

ANGLE ROLLS, 2"x2"x½" H. & W., '42
BOLT THREADER, 1½" Williams Reliance
BORING MILLS, 100" & 60" Cinci., 2 Hds., P.R.T.
BORING MILLS, 3½" & 4" bar Landis Floor (3)
BORE-HONE, Barnes, 10' stroke, 6" bore, '42
BRASS LATHE, 21" Acme, Late, Hardened Ways
BROACH, No. HP15 Lapointe, Hyd., Horiz., 1944
RADIAL, 5'12" col. Amer. Trip. Purp., M-on-arm
RADIAL, 5'14" col. Amer. Trip. Purp. AC, M.D.
DRILL, 28" Colburn No. 6, 3" capty. 15 H.P., AC
GEAR GENERATOR, 3" Gleason, Late
GEAR HOBBER, 36H Gould & Eberhardt
GEAR PLANER, 11" Rieneckor, Bovel
GEAR SHAPER, No. 75 Fellows High Speed 61A, 64 & 64A Fellows
GRINDERS, 20"x120" Landis, Cyl., Hyd., AC
GRINDER, 10"x48" Cinc., Cyl., M.D.
GRINDER, No. 16Y28 Bryant, Int., 1943
GRINDER, No. 174 Heald Gap, Int. 54" sw., '42
GRINDER, No. 72A5 Heald Internal, 1943
GRINDER, No. 75A Heald, Int. Hand Feed
GRINDER, No. 13 B. & S. Univ. M.D.
GRINDER, UNIV., 12"x36" Thompson M.D.
GRINDER, No. 6-T Sellers Tool, '42
LATHES, 50"x15' Cen. Niles, blocks to 88", M.D.
48"x20'0" cen. Simmons, like new, '42
32"x25' cen. Sommerfeld, 2 T.A., 2 carr., '42
24"x12' bed L. & S., Modern Timken Spin.
22"-24½"x48" cen. Skoda, New
20"x48" cen. American, T.A., (2)
14"x6' Hendey, T.A., AC, M.D.
16"x63" cen. P. & W., T.A., Collets
14"-16½"x54" cen. Bradford, T.A., '43
No. 16 LeBlond Pro. 20" sw. x 36" cen.
TAPPERS, Nos. 1 & 2 Bakewell (4)
TURRET LA., 26" Libby "C" 4½" capty.
Nos. 3 & 4 Gisholts, Late
No. 1B Foster Univ., 2" capty. (2)
RIGID-MIL, 96" Sundstrand, Tble. 30"x120"
THREAD MILLER, 12"x60" Morey Shields, '42
MILLER, 96" Sundstrand Rigid-mil, 30"x120" tble.
MILLER UNIV., No. 4A Brown & Sharpe
MILLER, UNIV., No. 2A B. & S., M. in base, Timken
MILLER, VERT., No. 4 Kempsmith, Maxi-Mil
MILLER, VERT., No. 4 Cinci. Hi Power, M.D.
MILLER, HORIZ., No. 2 Stand. K.&T., M-in-base
PIPE THREADER, 2" Landis, AC, M.D.
PLANER, 48"x36"x8' Cinci. 4 Hd., Box, PRT, Force Feed
SHAPERS, 24", 20" & 16" G. & E., AC, M.D.
SLOTTER, 20"x24" Dill, M.D.
22" & 18" Hercules, Univ., New

BENNETT MACHINERY CO.
375 Allwood Road, Clifton, N. J.
Off Route 5-3, Phone Prescott 9-8996

Robbins & Myers Electric Hoists & Motors. All sizes in stock
Roll-forming machines and Roller Dies
Engineering service on your metal-rolling problems
Brakes, Shears, Rolls, Sheet metal Equipment
Welders, Selsky, 125, 150 KVA, complete

J & L MACHINERY & SUPPLY CO.
7906 Mack, Detroit, Mich. WA 5-0800

LEAF BRAKE

12'x¼" DREIS & KRUMP. AC MOTOR DRIVE.

WEST PENN MACHINERY COMPANY
1210 House Bldg. Pittsburgh, Pa.

Latest Types — Guaranteed Machine Tools 1941-1950 Models

BORING MACHINES—PRECISION

BARNES: No. 412 Horizontal, 60" travel

BROACHING MACHINES

CINCINNATI: 2-36 Vertical Broach

CAM MILLERS & GRINDERS

SUNDSTRAND: #96 Double Head Miller for cylindrical cams
VAN NORMAN: Contour Miller 10CT
MOREY: 12M 2-Spindle Profiler
HEALD: 172 Sizematic Grinder for cylindrical cams

DRILLING MACHINES

AVEY: No. 2 Deep Hole Drill, 16" stroke—hydraulic
LELAND-GIFFORD: No. 2LMS Deep Hole
BARNES: 201¼ 2-spindle on 4-spindle base
BAKER: 30HO 2-spindle inverted, hydraulic
BAKER: 217 Upright Heavy Duty
FOSDICK: No. 4BM Upright, High Speed
PROVIDENCE ENG.: FV-6 Sensitive 6-Spindle, ⅜" capacity
PRATT & WHITNEY: ½B x 50 Deep Hole Reamer
ALLEN: #2 High Speed
ARCHDALE: Radial, all sizes (New)
WALKER-TURNER: D950, ½" capacity, bench type (new)

GEAR CUTTING MACHINES

BARBER-COLMAN: No. 3 Hobber
BROWN & SHARPE: No. 6 Gear Cutter 72" diameter
CLEVELAND: No. 140 Hobber—1 spindle
FELLOWS: 61, 61A, 64A, 622, 7 and 72 Shapers
FELLOWS: Straight Line Generator
GLEASON: #12 Rough & Finish Generator
GLEASON: 3" Straight Bevel Gear
GOULD & EBERHARDT: 12H Hobber
GOULD & EBERHARDT: 36RM Cutter
HAMILTON: No. 1 Hobber, 6" diameter
SYKES: Gear Shaper 14" external, 20" internal
SYKES: Rack Cutting Machine 24"

GEAR FINISHERS & TESTERS

FELLOWS: 8LS1 and 13 LS1 Gear Lappers. External & Internal. Spur and Helical
FELLOWS: No. 12-C Spacing Tester
GLEASON: No. 13 Universal Tester
GLEASON: No. 4 and No. 6 Bevel Gear Testers, Hand and Power Operated
GLEASON: 3" Bevel Gear Tester
ILLINOIS: No. 224 Involute Checker and Recorder
ILLINOIS: 514 Center distance & Concentricity Checker.
ILLINOIS: 604 Bevel Gear Hand Rolling Fixture.

GEAR & SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel
GEAR GRIND MACH.: GG-10, 10"x24" Hydr. Spur Gears and Splines, also Internal
GLEASON: No. 17 Spiral, Zerol and Hypoid

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 and No. 23 Plain
CINCINNATI: 6"x18" Hydraulic
CINCINNATI: 10"x36" Hydraulic
CINCINNATI: No. 2 Centerless
LANDIS: 16"x16" "C" Plain Hydraulic
LANDIS: 16"x32" Type "D" Crankpin, Hydraulic
VAN NORMAN: #686 Crankshaft Regrinder
NORTON: 6"x18" & 10"x18"
NORTON: 10"x18" 45 angle wheel head

GRINDERS—GEAR & SPLINE

PRATT & WHITNEY: 10" single and double wheel
GEAR GRIND MACH.: GG-10, 10"x24" Hydr. Spur Gears and Splines, also Internal
GLEASON: No. 17 Spiral, Zerol & Hypoid

GRINDERS—INTERNAL

BRYANT: No. 5Y Internal
BRYANT: 112 Universal, Hydraulic
BRYANT: 16C16 Hole, Hydraulic
HEALD: 70A Plain
HEALD: 72A3, 72A5 Plain and Univ.
HEALD: 72A3 Sizematic Centerless
HEALD: 72A5 T-bed, Universal
HEALD: 172 Sizematic for cyl. cams
RIVETT: No. 104 Tool Room

GRINDERS—RADIUS

VAN NORMAN: No. 73, 639, 649
VAN NORMAN: No. 3½ Universal

GRINDERS—SURFACE

ARTER: A-1—6" Rotary
ARTER: A-3—12" Rotary
THOMPSON: 6"x12"x18" Type B
HEALD: 8" Rotary
HEALD: No. 22 Rotary—12" Chuck
GARDNER: 120A Opposed Head Disc
GARDNER: #6 Disc Grinder

GRINDERS—THREAD

EXCELLO: No. 31 and No. 33 External
JONES & LAMSON: TG-1245 External

HONING MACHINES

BARNES: No. 306H Vertical
BARNES: 307 Vertical
MICROMATIC: H-510 Double End Horizontal
MICROMATIC: H-2 Single End Horizontal

LAPPING MACHINES

FELLOWS: 8LS1 and 13LS1 Gear Lappers
NORTON: No. 26 Hyprolaps
NORTON: No. 2F x 40" Diameter
SCHRANER: Model A External Cylindrical Lapper—6 heads.

LATHES—PRODUCTION

BLOUNT: H5 polishing
LEBLOND: 25"x48" Engine, raised to swing 40"
LIPE-ROLLWAY: 15"x30" Carbomatic
LODGE & SHIPLEY: No. 3A Duomatic
MICHIGAN: #1708 and 1712 Relieving

LATHES—TURRET

BULLARD: 24", 36" Vert. Spiral Drive
WEBSTER & BENNETT: Vertical Turret Lathes, 36" and 48" diameter
GISHOLT: #2L Saddle Type, Extended bed
HERBERT: Turret Lathes, all sizes (New)

MILLING MACHINES

CINCINNATI: 2-spindle Vertical Hydrotel with two rotary tables
CINCINNATI: No. 2M Vertical, Rotary table with power feed.
CINCINNATI: 0-8 Vertical
CINCINNATI: No. 4 Vertical
REED-PRENTICE: #5 Vertical 16"x60" table
SUNDSTRAND: 96 Rigidmil-Duplex (for milling cam tracks in propeller hubs or similar)
SUNDSTRAND: Nos. 0 and 00 Rigidmil.
MOREY: 12M 2-spindle Profiler
TAYLOR-FENN: M-80 Duplex Spline
TAYLOR-FENN: Vertical 6"x21" table
RICE-BARTON: Duplex Spline
VAN NORMAN: Contour Miller 10CT

SAWS & CUT-OFF MACHINES

MOTCH & MERRYWEATHER: No. 3 Circular Saw
TANNEWITZ: GH-36 Band Saw
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed
CAMPBELL: No. 425 Cutalator Abrasive Cut-Off
WILLIAMS: 10" Pipe & Tube Cut-Off

THREAD MILLERS & TAPPERS

HALL PLANETARY: D Thread
LEES-BRADNER: LT 6"x36" Thread
LEES-BRADNER: 40A Thread Miller
MOREY: 12"x60" Thread Miller
MURCHEY: No. 22 Tapper, Horiz.
NATCO: Vert. Tapper 16 spindle
PRODUCTO: Hand Tapper

TOOL SHARPENERS

OLIVER: 2A Face Mill Grinder
OLIVER: 510 Drill Sharpener
OLIVER: 10" Tool Bit-Template
FELLOWS: Flat Top Helical Gear Cutter
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New)
WALKER-TURNER: Bench Grinder ½ HP

MISCELLANEOUS

BAR POINTER & CHAMFER: Kent 3¼"
BAND SAW: Tannewitz, GH-36"
CUT-OFF: Campbell, Abrasive 425 Cutalator
CUT-OFF: Pipe & Tube, 10" Williams
DIE SINKER: Reed Prentice No. 5, 16"x30" Table
DISC GRINDER: Gardner 120A, 2 heads
DISC GRINDER: Gardner No. 6
GRINDER: Walker Turner ½ HP Bench Type
LATHES: Blount Polishing 12"x48"
MOLDING: Jolt Rollover, Osborn No. 602
PRESS: Screw, Gen. Flex. 3 ton
RACK CUTTING MACHINE: Sykes 24"
RIVETER: Gen. Engr. 24" throat
TEST STAND: Denison 818-AM Hydraulic

TRIPLEX MACHINE TOOL CORP.

75A WEST ST. Phone: HAnover 2-4520 *Cable Address:* "TRIMACTOOL" **NEW YORK 6, N. Y.**

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY—THE MARK OF DEPENDABILITY

UPRIGHT DRILLS

No. 1 Minster Hi-Duty, m.d.
20" Barnes All Geared, m.d., tapper
20" Cincinnati, belt drive
30" Rich H.D., m.d.
32" Aurora, belt drive
No. 25 Foote-Burt, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., m.d.
No. 317 Baker H.D., s.p.d.
B225H Natco H.D., m.d.
24" Cincinnati-Bickford, m.d. thru gear box on base

GEAR SHAPERS

No. 6 Fellows, belt drive
No. 7, 7A Fellows, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 6I Fellows, belted m.d.
No. 61A Fellows, m.d., latest type
No. 64B Fellows, m.d.
No. 615A Fellows, m.d., late type
No. 64A Fellows, m.d., latest
No. 645 Fellows, m.d., latest
No. 645 Fellows, belt
No. 72 Fellows, m.d., latest
No. 75 Fellows, m.d.

GEAR GRINDERS

6x20" Fitchburg Hydraulic Spline & Gear Grinder, m.d.
9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic Spur & Helical, m.d.
No. 2HB Lees-Bradner Spur & Helical, m.d.
No. 13LB Fellows Gear Lapper, m.d.

GEAR HOBBING MACHINES

Type A Barber-Colman, m.d.
No. 12 Barber-Colman, single overarm, m.d.
No. 12 Barber-Colman, Double overarm, m.d.
No. 12H Gould & Eberhardt Universal, m.d.
No. 34 Brown & Sharpe, m.d.
No. 44 Brown & Sharpe Spur & Spiral, m.d.

GEAR CUTTERS

No. 4—46" Brown & Sharpe Automatic Spur Gear Cutter, m.d.
Gleason Spiral Bevel Gear Rougher, s.p.
3" Gleason Straight Bevel, m.d.
8" Gleason Straight Bevel, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
Cincinnati Gear Burnisher, m.d.
Cross Gear Tooth Rounder, m.d., 9" cap.
National Broach & Machine Co. Red Ring Gear Speeder, 10" cap.

GEAR TESTERS

Gleason Gear Tester for hypoid gears
No. 1 Brown & Sharpe Spur Gear Tester
No. 4 Gleason Angular Hand Rolling Tester, m.d.
12" cap. National Broach & Machine Co.
18" National Broach & Machine Co.

CENTERLESS GRINDERS

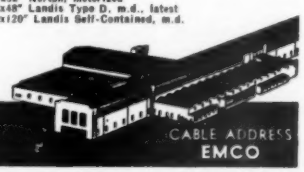
No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, cap. ⅝" valve stems, m.d.

CYLINDER GRINDERS

No. 50 Heald Hydraulic, m.d., 11-18" spindles
No. 55 Heald, m.d., 15-24" spindles
No. 73 Heald Airplane Cylinder Grinder, m.d., brand new, late type

PLAIN CYLINDRICAL GRINDERS

6x18" Cincinnati Hydraulic, m.d.
6x18" Landis Type C Hydraulic, m.d., late
6x18" Norton Type C Hydraulic, m.d., latest
6x20" Cincinnati Hydraulic, m.d.
6x32" Fitchburg Type A, m.d., late
7x11" Leach External Grinder, s.f.
8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
No. 10 Brown & Sharpe Self-Contained, m.d.
No. 11 Brown & Sharpe Self-Contained, m.d.
10x18" Landis Type C, m.d.
10x24" Landis, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x72" Brown & Sharpe, belt
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis, m.d.
12x48" Cincinnati Plain Self-Contained, m.d.
12x48" Cincinnati, spline grinding attachment
12x48" Modern, belted m.d.
12x96" Landis, m.d.
14x18" Cincinnati Plain Self-Contained, m.d.
14x48" Cincinnati Plain Self-Contained, m.d.
14x50" Norton, motorized
14x52" Norton, motorized
16x48" Landis Type D, m.d., latest
20x120" Landis Self-Contained, m.d.



WRITE FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio — MElrose 1241 — CABLE ADDRESS EMCO

GUARANTEED TOOLS

24" x 168" cc. LODGE & SHIPLEY Lathe, New 1942, 2 carriages, 2 chucks, 25HP motor.
24" x 108" cc. BOYE & EMMES Geared Head Lathe, taper, chucks, M.D.
No. 5 MIDLAND Turret Lathe, Preselector Head, Hard ways, New 1942
No. 2B FOSTER Turret Lathe, Saddle Type, 3¼" bar cap., Timken Spindle.
No. 2B MILWAUKEE Plain Mill, geared feeds and speeds, Double overarm.
No. 4 CINCINNATI Plain Mill, geared feeds and speeds, rapid traverse, M.D.
No. 6A POTTER & JOHNSON Automatic Chucker, Timken spindle, hard ways, factory rebuilt, M.D.
24" BULLARD New Era Vertical Turret Lathe, M.D.
36"/44" NILES Vertical Turret Lathe, side head, M.D.

100" BERTRAM (NILES Patterns) Vertical Boring Mill, with 2 swivel Heads, rapid traverse, M.D., New 1932. Excellent Condition.

No. 7 GLEASON Revex Bevel Gear Rougher, New 1943, like new.
No. 130 CLEVELAND Rigid Hobber, New 1942, like new.

O'CONNELL MACHINERY CO

McDONALD USED MACHINERY

Bausch 44" Hvy. Duty Vert. Boring Mill, 2 Hds.
Bullard 36" New Era Vert. Turret Lathe with side head
Hilles & Jones 2" Cap. Guillotine Shear
Brown & Sharpe No. 2 High Speed Vert. Miller, 1942
American 4' Enc. Head Radial Drill 12" col.
Dill 18" Str. A.C. M.D. Vert. Slotter adj. head
G & L and Universal 3" Bar Horiz. Boring Mills
20" All Grd. Camel Back Drill
Cin-Bick 3' & Morris 3½' Arm Radial Drills
Blanchard M.D. Vert. Sp. Surface Grinder 20" chuck
L & S 20" x 8', 18" x 21', 20" x 10', 28" x 12'
Monarch 20" x 8', Amer. 20" x 12' grd. hd. q.c.g. m.d. Engine Lathes
B & S Nos. 2-B & 3-B, Cin No. 3 Mill, No. 2-B & 3-B, Cin. No. 5 LeBlond No. 4, Grd. Hd. Plain Millers
B & S No. 2-A & 3-A, Mill, No. 2-B, Cin. No. 1-M, Cin. No. 2 Grd. Hd. Univ. Millers
Campbell No. 213 abrasive cut off.
Brake D & K Leaf type Power 10' Length ¾" Capacity
Bullard 24" & 36" Vert. Turret Lathes
Lynd-Farquhar 20" stroke openside Shaper Planer
Le-Swing R-14 late production Lathe
K&T No. 2K Universal Miller
Avey 2-Spindle MA8 Drill Press late
Cin. 24" M.D. Univ. Shaper.
Cleveland 48" x 12" Table Openside Planer, 3 Hds.

MONA MEMBER

McDONALD MACHINERY CO.
1531-35 No. B'way., St. Louis 6, Mo.

MODERN MACHINES

2G Brown & Sharpe Automatics
#2L6 LaPointe Horizontal Brooch
10" x 36" Norton Cylindrical Grinder
612A Fellows Gear Shaper
#35 Excello Thread Grinder
16" x 10' Pratt & Whitney Lathe
36/90 Cincinnati Duplex Miller
24" Potter & Johnston Shaper

HAZARD BROWNELL MACHINE TOOLS, INC.
350 Waterman St. Providence, R. I.

FOR SALE

Wickes Bros. Pit Lathe. 10 ft. face plate.

SARGENT ENGINEERING INC.
Fort Dodge, Iowa

GEAR AND SPLINE GRINDER

Type GG-35 GEARGRIND—18" External, Hyd. Table Stroke 27" New 1942—220/440/3/60 Elec.

WEISBECKER MACHINERY COMPANY
149 Broadway New York 6, N. Y.

POWER PRESSES

BLISS, TOLEDO, V & O, ETC.
REBUILT - GUARANTEED

MONA MEMBER

JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

B & S Auto. Magazine Feeds, M.D.
No. 2 Press-Rite Presses, dial feeds, 1947.
Weissmann Type R-11 Punch.
Grenby Model 1G-20 Internal Grinder

D. E. DONY MACHINERY CO.
47 Laurelton Rd., Rochester 9, N. Y.

GUARANTEED EQUIPMENT *IMMEDIATE DELIVERY*

BORING MILLS
Bullard 24", VTL New Era
Cleveland 2½" Bar Cap.
Giddings & Lewis No. 0, 3" cap.
Giddings & Lewis No. 32, 3½" cap.
King 42" & 72" Vert. 2 rail heads
Lucas No. 31 Precision, 3" bar
Niles-Bement-Pond 4" Bar
Niles-Bement-Pont 4½" Bar
Niles-Bement-Pond 60" Vert.

DRILLS AND RADIALS
American 3' sensitive motor on arm
Buffalo #2 Motor Spindle
Cincinnati Bickford 6' x 13" cal.
Sibley 24" & 28"

ENGRAVERS
Gorton #1A 2 Dimensional
Gorton #3B 3 Dimensional

GEAR EQUIPMENT
Barber-Colman #12 Hobber (2)
Brown & Sharpe #13 Cutter
Fellows High Speed Shapers 712, 72, 725
Flather 72" Cutter
Gleason 3" Straight Bevel Generator
Gleason #4 Angular Bevel Tester
Gleason #2 Surface Hardener
Gould & Eberhardt 36" Cutter, Univ.
National Broach Red Ring Lapper
Schuchardt & Schutte #1 Hobber

GRINDERS, MISCELLANEOUS
Brown & Sharpe #2, #3 Univ.
Cinn. 12 x 48" Univ.
Covel #91A Univ. Tool & Cutter, Hammond #4

Heald #81 Internal Gagematic
Heald 72A3 Int. Centerless Sizematic, #1 Tool
Landis 12"x36" Univ., Latest
Landis 6" x 30" Type C Cyl.
Norton 6"x18", 6"x30" Type C cyl., 10x18"
Norton 14"x48" Type C Univ.
Oliver #510 Drill Pointer, Sellers 4G, 6G, Black Diamond
Porter Cable Belt WGB, G8; Granby Int.
Pratt & Whitney Radius #K6, K.O. Lee Tool

GRINDERS, SURFACE
Abrasive 3B 8x24", #33, #34 Vert.
Blanchard #16, 30" Mag. Chuck
G & L #45 12" x 24" Hyd. Feed, #5 10" x 36"
Heald 22—12" chuck, Arter 12"
Norton 10" x 36" Hyd.
Pratt & Whitney 12 x 36" Vert.
Reid 11x36 Motor in Base
Thompson Hyd. 6 x 10 x 18", 6 x 12 x 18"

LATHES
American 20" x 8' Bed G.H. Lathe
L & S #2A Duomatic, Like New, #3 Duomatics
Hardinge Precision 9", 1" Collet Cap., Rivett
Hendey 14" Yoke Head Lathes
LeBlond Regal 10" x 3' bed
Putnam 36" x 22'
Putnam 42" x 17'
Sebastian 12" x 4' G.H.
Wickes 32" x 35' Geared Head

MILLS, PLAIN, UNIVERSAL & PROD.
Brown & Sharpe #000, 21, #2A Univ.
Burke #4 Plain & Univ. Vert. Hd.
Cinn. 08 PL & Vert.—Rise & Fall
Cincinnati, 1M Univ.
Kent Owens IV, 1M
Sundstrand 00, 0 Rigidmil

MILLS, VERTICAL
Brown & Sharpe #3 single pulley drive
Cincinnati #4, 08 Vert.
Marey #12M Profiler, 2 sp.
Pratt & Whitney #12B Profiler 2 Sp.

PRESSES
Bliss 645, 650 HI-Production Presses
Bliss 20, OBI, 58, 62, 162 OB.
Bliss 4½ Double Action, Roll Feeds
Bliss #78½, 330 Ton SS
Bliss 3½A Double Action Toggle
Ferracute EG54, 400 Ton Knuckle
Niagara A1¾, O.B.I.
Toledo 400 Ton Knuckle Joint #663
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing

HYDRAULIC EQUIPMENT
SELF CONTAINED PRESSES
500 Ton Lake Erie, 35" x 36" Platen 36" stroked opening
500 Ton Shaft Straightener 24' Long Bed. Watson Stillman
125 Ton Southwark Press, Bed 96" x 30". 30" stroke, 2 to 4 ft. opening
50 Ton Burroughs 8" stroke 18" x 17" Platen, 18" opening
80 Ton Wilson Press, 51"x24" Platen, 11½" St. 13" opening
50 Ton Hannifin, 20' St. 30 x 22 Bed—24" opening
35 Ton Oil Gear Straightener
50 Ton Stokes Molding Press
MISCELLANEOUS PRESSES
550 Ton Southwark, 42" x 32" Platen 28" St. 48" opening
300 Ton Watson Stillman 24 x 20" Platen 11" St. 21" opening
All Hydraulic Equipment is completely engineered and checked by a competent staff, thus assuring reliability. Send us your Hydraulic problems.

NEW IN STOCK
Air Hydraulic Presses—Arbor Presses #6C Famco—Band Saws Kalamazoo—Drill Presses all sizes—Hydraulic Press Northern 20 Ton—Injection Molders, 1 ounce—Power Presses, OBI, 1, 4½, 5, 7½, 10, 15, 20, 30 ton—Shaper, 7" Amco, 8" Shaperite—Shaper, Sheldon 12"—Shears, Foot 22" to 8', 16 & 18 ga.—Shears, Power, 3'x18 gauge to 10'x 10 ga.—Welders, Arc, Seam, Spot all sizes —Vert. Milling Attach. Halco H.S.—Motors, Grinders, Buffers, all sizes, etc.

TURRET LATHES
Acme 6W Fox
Brown & Sharpe, #1, 2 Hand
Denver 6. 2" Shell Turret (3)
Gisholt, 2L, Foster #3B
Jones & Lamson 2½" Saddle Univ.
#4R Libby 2" Cap. Univ.
Warner & Swasey #1A, 2A, #5 Univ.
Warner & Swasey #2 G.H. Late

MISCELLANEOUS
Automatic B & S #00G
Automatic 4 Sp. 1½" Cone
Band Saw: Tannewitz #36M, DoAll Zephyr 36"
Filers—Do All Band Filer
Filers—Grob Band Filer
Hacksaw: Marvel #6A, #6, #9; Peerless 6"x6"
Honer: Micromatic #H-1
Keyseater: Davis, Baker, M & M

This is but a partial listing. Write for free Catalog. Inquiries invited. HUNDREDS OF OTHERS

AARON MACHINERY CO., Inc., 45 Crosby Street, New York 12, N. Y.
"CABLE—AARMACH N. Y." **Telephone WOrth 4-8233**

MACHINERY FOR SALE

1—Niles Bement Pond Wheel Press—600 ton heavy duty for locomotive wheels

1—300 ton Niles Bement Pond wheel press—#13811

1—400 ton Niles Bement Pond wheel press—#19271

2—Niles Bement Pond Wheel lathes—double head—swing over ways 92" diameter of face plate 90"

1—Ingersoll Rand Compressor 480CFM—Imperial Type XB —RH 41820PP—16x14—LH 41819 PP—10x14—100 et. pressure

First-Class condition — Prompt shipment — Subject to prior sale

Write or Wire Collect for Details

FRANK M. JUDGE & COMPANY, INC.

(Transportation Specialists)

7010 EMPIRE STATE BLDG. NEW YORK 1, N. Y.

YOU DON'T NEED A D-O ORDER to get *DELIVERY!*

BORING MILLS—Vertical

BULLARD 24" N.E. type; M.D.
GISHOLT 42"; P.R.T.; Motor Drive
KING 52"; 2 swivel heads; PRT; MD
NILES 100"; 2 swivel heads; PRT DC M.D.
NILES BEMENT POND 144" heavy duty; MD

BORING MILLS—Horizontal

EXCELLO No. 54 double end; latest
LANDIS No. 35, 3½" bar; floor type; MD
NILES BEMENT POND 8" bar; floor type; MD

DRILLS

FOOTE-BURT 20 spdl. Hydr; latest
BARNES No. 240, 2 spindle, hydr.; latest
BARNES N-2 Hydram, self-oiling; 2" cap; latest
BARNES N-3 Hydram, hydr. inverted; latest
BARNES 20" 4 spindle; Camel Back; Latest
BAUSH No. 1½x30, 2-spindle; Latest
LeBLOND No. 2 spl. spdl.; hydr.; latest
NATCO 2BL Multiple; PRT; MD latest
NATCO D5 Adj. Multiple; latest
NATCO No. 14 Multiple; rect. hd; PRT; MD

GRINDERS—Plain & Universal

BROWN & SHARPE No. 1, 2, 3, 4 Univ.; Latest
CINCINNATI 16x36" Univ. ER; Hydr. Latest
CINCINNATI 12x48" Univ.; Latest
LANDIS 6"x18" type C pl.; hydr. Latest
LANDIS 10"x18" type C Hydr.; Latest
LANDIS 18"x72" Plain; Motor drive
LANDIS 29"x130" centers Plain; MD
VAN NORMAN No. 666 Crankshaft, regrind; Latest

GRINDERS—Miscellaneous

BRYANT No. 3, 5, 16-C-16, 16-CP-16, 24-36" Internal hydr.; latest
HEALD No. 72A5 Internal; latest
HEALD No. 72A5 Gagematic Int.; Latest
LaPOINTE 60" Univ. Broach sharpener; latest
PRATT & WHITNEY 10" gear grinder; hydr.; latest
THOMPSON 6x48" Auto. round broach; MD
VAN NORMAN 639 Cte. Radius; Latest

GRINDERS—Surface

ABRASIVE No. 34 Vertical Spindle; M.D.; Latest
BLANCHARD No. 16A Vertical; dial feed; M.D.
HEALD No. 22 Rotary, 12" chuck; Latest
HEALD No. 25A Rotary, 24" mag. chuck; late
PRATT & WHITNEY 14"x36" type B hydr; latest

GEAR CUTTING EQUIPMENT

BARBER COLMAN No. 12 Hobber motor drive
BILGRAM 6", 16" cap. Bevel Gear Gen; MD
BROWN & SHARPE No. 13 Spur, bevel cutter
CROSS No. 1 Tooth Rounder; motor drive
FELLOWS No. 6IA, 6Z2, 7, 7A, 71, 7125, 712, 725 High Speed Gear Shapers; latest
FELLOWS No. 12M Involute Measuring Instr.; Latest
FELLOWS No. 8M Red-Liner; latest type
GOULD & EBERHARDT 36BM 3 spdle. Rougher
GLEASON 3", 12" straight bevel gen. Latest
GLEASON 4, 6, 18" Bevel and Hypoid Tester
GLEASON No. 14 Hypoid Grinder; Latest
GLEASON 24", 37", 77", 96" Bevel Gear Planers
GOULD & EBERHARDT No. 96H Hobber; MD
GOULD & EBERHARDT 18H Hobber; MD
NEWARK No. 5, 72" cap. Hobber with differential, infeed; Motor Drive
SCHUCHARDT & SCHUTTE No. 1 Hobber; M.D.

LATHES—ENGINE and Mfg.

AMERICAN 36"x33" centers geared; MD
AMERICAN 36"x360" centers; 2 carriages; MD
JONES & LAMSON "FAY" 24"x24" Auto.; latest
JONES & LAMSON "FAY" 20x252" Auto; latest
LeBLOND 16"x36" centers; Auto. TIMKEN; Latest
LeBLOND Mod 7ACL crankshaft turning; MD
LODGE & SHIPLEY No. 5x24" and 96" centers "Duomatics"; TIMKEN; latest
LoSWING 4x60, 4x84, 8x60, 8x108, 7x34; Latest
MONARCH 16"x28" centers; geared head; MD
MONARCH 22"x454" centers; 3 carr. Timken; MD
NILES "Time-Saver" 20x11' centers; TIMKEN PRT; Latest
NILES "Time-Saver" 30"x50' Boring, TIMKEN; latest
NILES 48"x32' centers engine; geared; MD

LATHES—RELIEVING

U.S. TOOL No. 8-10, 6"x15" centers; Latest
CLEVELAND 12"x16" centers; motor drive

MILLING MACHINES—Plain

CINCINNATI 00, 2-24, 3-24, 2-18 Auto.; latest
CINCINNATI 3-24 hydromatic; latest
CINCINNATI 4-48, 4 spindle Tracer; Latest
SUNDSTRAND No. 3 Rigidmill; Timken; MD

MILLING MACHINES—Mfg.

CINCINNATI 24" Duplex; Motor Drive
INGERSOLL 42"x42"x14" r hds. planer type adjustable rail; latest
INGERSOLL 32"x24"x16" planer type; 2 hds; MD
INGERSOLL 30"x24"x12" Adj. Rail Slab; MD
SUNDSTRAND Model 3A Duplex, 42" feed; latest
TAYLOR & FENN M80 Duplex Spline, Latest

MILLING MACHINES—Thread

HALL style D planetary; latest type
MOREY 12x30", 60", 120" centers; Latest
PRATT & WHITNEY 4½x12 Mod C; latest

MILLING MACHINES—Vertical

CINCINNATI 00 TIMKEN; latest
CINCINNATI No. 3 H.S. dial type TIMKEN; latest
SUNDSTRAND No. 3 profile & Channel; Latest

PRESSES

BIRDSBORO 325 ton vert. hydr; latest
BLISS 410A DC toggle drawing; 350 tons
BLISS No. 3½ geared DA toggle drawing
CLEARING K-1200-30 Knuckle joint 200 tons; latest
GLEASON 15", 25" Quenching; hydr. MD
LAKE ERIE 500 ton Vert. hydr; LATEST
LUCAS 30 ton Forging; latest type
NIAGARA No. 512, 282 tons; geared tie rod MD

PLANERS

BETTS (CONSOLIDATED) 108"x84"x50' r hd rapid traverse, box table DC; motor drive
BETTS (CONSOLIDATED) 84"x92"x14' 4 hds; rapid traverse; box table DC motor drive
CLEVELAND 48"x48"x12' openside; AC M.D.
LIBERTY 48"x48"x18' r hds; box table vari-voltage drive; latest type
LIBERTY 7'x48"x22' convertible openside 4 hds; box table; PRT vari-voltage; Latest
LIBERTY 144"x78"x48" openside; convertible; PRT box table; Latest type
NILES 108"x84"x42' 4 hds; rapid traverse box table DC motor drive
SELLERS 60"x60"x12' 4 hds; vari-voltage drive; P.R.T.; Latest type
WOODWARD & POWELL 54"x36"x20' 4 hds; MD

Partial listing from America's largest stock. Send for our latest catalog.

MOREY MACHINERY CO., INC.

406 BROOME ST., NEW YORK 13, N. Y.
TELEPHONE: CANAL 6-5360
CABLE ADDRESS: WOODWORK, N. Y.

COLLETS & MACHINERY

Visit Our Offices and Warehouse at

820 W. LAKE ST.

Call, Write or Wire GRAFF — Immediate Shipment of Collets, Feed Fingers, Pads & Parts on all stock items. Save Money—Save Time —See Us Now!

Used COLLETS

R. A. 6 Gridley Automatics — 1", 1¼", 1⅝", 2", & 2⅜". 1x 5 New Britain, Gridley Model F, ¾, ⅞, 1¼, 1⅜, 1¾, 2¼, 2⅜, 3¼, 4¼. Extra large stock of 2⅜, R.A. 6 Gridley parts and collets. Acme S15 51, 52, 53, 54, 55 and 56, Acme Gridley, Cleveland, Cone, Foster, No. 1, 2, 4, and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and Model 60 and 61 New Britains & Greenlee.

SPECIAL — Large Stock of Collets, feed fingers and parts for late type 1" and 1⅝" Greenlee Automatic.

GRAFF MACHINE TOOL CO.

820 W. Lake St. TA. 9-5700 Chicago 7, Ill.

LATE MODEL TOOLS

16"x54" AMERICAN "Pacemaker" Multi-Production Engine Lathe
16"x30" MONARCH Model C Toolmaker's Lathe
12" & 20" FAY Auto. Lathes
No. 3H K&T HIGH SPEED VERTICAL MILLER
No. ½B P&W Two Spindle Reaming Machine, 1944
No. 145 CLEVELAND Rigid Hobber
No. 12 FELLOWS Gear Shaver
No. 1LMS LELAND-GIFFORD 6-spindle Drill, 1942.
#2LMS LELAND GIFFORD 2-Spindle Drill
#3MS LELAND GIFFORD 2-Spindle Drill
#48H G&E Univ. Gear Hobber
No. 725A FELLOWS H.S. Gear Shapers
H3 BARNES "Hydram" S.S. Drill

Wigglesworth MACHINERY Co.
MACHINE TOOLS
203 BENT ST.
CAMBRIDGE 41
MASS.
KIRKLAND 7-5242

MANUFACTURER WANTS TO SELL THE FOLLOWING:

1—Browne & Sharpe Drill Pointer #2.
1—Porter & Cable Wet & Dry Belt Sanding Machine for 3" Belt.
1—Drill Grinding Machine Type 6 G Serial #02-1995.
1—Pangborn Portable Sand Blaster Serial #11-C3-46104
1—Lo-Hed Electric Hoist Capacity 2,000 lbs. Serial #1803
1—Table Saw (Belt Driven) Tilting Table (36"x48") 12" Blade.
1—Rivett #104 Internal Grinder, Serial 976, 9" Swing, 12" Travel. Attachments 4" Jaw Independent Chuck, 3" Jaw Univ. Chuck.
1—Ames #7 Planer 28" wide, 24" high, 6 ft. stroke. — *All machines Late Models.*

FS9036 AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

FOR SALE

(1) Ex-Cell-O #33 Thread Grinder
Excellent Condition

TRI-KRIS COMPANY
Box 631 Lansdale, Pa.

BULLDOZER No. 23 Williams

White 60 ton double geared, motor drive, good condition, f.o.b. Los Angeles, $1,500.00.

DAVIES & SON, INC.
1416 Westwood Boulevard, Los Angeles 24

SHEET METAL MACHINERY

NEW and USED — HAND and POWER.

Apron Brakes, Press Brakes, Shears, Forming Rolls, Power Presses, Pittsburgh Lock Machines, Spinning Lathes, Spot Welders, etc.

MONY MACHINERY

B. D. BROOKS, INC.
361 Atlantic Ave., Boston 10, Mass.

MACHINERY FOR SALE
ATTENTION EXPORTERS!

Unusual opportunity to procure modern Fellows Gear Shapers 6I5A and 645 as well as 12" Gleason Generators, 36 BM Gould & Eberhardt Rougher, 27 Fellows Gear Shaper, #10 D. E. Whiton Machine. Write for full information.

FS-1633, AMERICAN MACHINIST
330 W. 42 St., N. Y. 18, N. Y.

NEW
Guaranteed Rebuilt
MOTORS-GENERATORS-CONTROLS
NOW IN STOCK
We buy surplus equipment
L.J. LAND Inc.
Box 756 Reading 2 Pa.

PRESSES

300 ton Clearing Crankless, New 1942, 12" stroke, air cushion, Model F-1300-42.

180 ton Cleveland, New 1942, 18" stroke, Model #14-S.

150 ton Niagara, New 1943, #610C dble. crank, air cushion, 8" stroke, 4½" draw.

125 ton Niagara, New 1943, #69B, dble. crank, air cushion, 8" stroke, 4½" draw.

Bending Roll, 8' x ½" Newbold, pinch, all steel, 1940.
Boring Mill, #0 Giddings & Lewis, 3", horiz. (2).
Boring Mill, 72" Betts, vertical, 2 hds.
Boring Mill, 60 Gisholt, vertical, 2 hds.
Boring Mill, #32 Lucas 4" bar, table type.
Boring Mill, 44" Bullard Maxi-Mill, Vert. PRT, M.D.
Grinder, Surface, #34 Abrasive Vert., '41.
Grinder, #5 Bryant, internal, late.
Grinder, Surface, 6" x 18" Norton, hydraul., '43.
Lathe, Automatic, 12" x 21" Fay, 1940.
Lathe, 68" x 24' Niles, grd. hd., M.D.
Lathe, 36" x 30' Putnam, grd. hd., M.D.
Lathe, Gap, 19"/38" x 10' c.c. LeBlond, Timken.

For: Quality and Integrity!!

Buy with complete confidence from one of America's oldest and largest machinery houses—known the world over.

Get the best! **Good machinery, properly reconditioned and fully guaranteed. Here are a few representative items from stock.**

Lathe, Automatic, 12" x 24" Lipe-Carbo.
Lathe, 16" x 6' South Bend, late (4).
Miller, Prod., #000 Brown & Sharpe, 1942.
Miller, Prod., #1-18 Cincinnati.
Planer, 42" x 42" x 16' Gray, 3 hds., M.D.
Turret Lathe, #2 Bardon & Oliver, 1943.
Welder, 50 KVA Acme air-press, spot, timer, late.

[WANTED Yes, we want good machine tools in any quantity. Call or write us today. **]**

CABLE OBRIEN PHILA.

THE O'BRIEN MACHINERY CO.

REGISTERED U. S. PATENT OFFICE

PHILADELPHIA'S LARGEST MACHINERY DEALERS AND EXPORTERS

PHONE GArfield 6-1150

1545 N. DELAWARE AVE., PHILA. 25, PA.

MUST MOVE PROMPTLY FROM LOCAL CUSTOMER'S PLANT

BEMENT MILES 18" SLOTTER with 3" dia. spindle. M.D.

KING BORING MILL 42" 2 swivel heads. 38" table. 4 chuck jaws. M.D.

GOULD & EBERHARD 40" Gear Cutter, M.D.

BROWN & SHARPE #5—48" Gear Cutter, M.D.

KEMPSMITH #4 Maxi-Miller, M.D.

BINSEE MACHINERY COMPANY HORIZONTAL BORING MILL. Table 30"x64". Quantity of boring bars.

LODGE & SHIPLEY 30"x72" c to c Geared Head, Quick Change Lathe, M.D.

CINCINNATI 60"x60"x12' Planer. 4 heads. 1 extra side head on massive floor stand for open side work. M.D.

CINCINNATI BICKFORD 7' RADIAL DRILL 17" column. M.D.

CINCINNATI BICKFORD 6' RADIAL DRILL 19" column. M.D.

LEBLOND 28"x14' QUICK CHANGE LATHE. M.D. Old, but good.

AMERICAN 20"x16' QUICK CHANGE GEAR LATHE. M.D. Old, but good.

BARNES HEAVY DUTY 26", 4-SPINDLE DRILL. 1 spindle for tapping. M.D. #5 M.T.

GRINDERS—CYLINDRICAL. B & S #11. 12"x 32". Plain Grinder. Table swivels. Motorized.

LANDIS 10"x36" Plain, M.D. Also Planer type Grinder 16"x36".

GRAY 32"x32"x10' PLANER. 2 swivelling heads. M.D.

"BEMENT" 26" STROKE TRAVERSING HEAD SHAPER. 48" travel to ram. 2 tables.

THE OSBORNE & SEXTON MACHINERY CO.

P. O. Box 88 Columbus 16, Ohio

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

20"#2" Fay Automatic. 1942.
No. 3-B Sico ⅝" Cap. 1942.

DRILLS

4' 11" Canedy Otto Radial.
No. 2 LMS Leland Gifford Hyd. 1942.

GEAR EQUIPMENT

No. 615A3 & 61A Fellows Gear Shaper. 1944.
No. 6 Gleason Revacycle. 1940.
No. 6 Gleason Gear Tester. 1942.
6" Red Ring Internal Shaver. 1942.
15" Red Ring Lapper. 1942.
Red Ring Universal Tester. 1942.

GRINDERS, CYLINDRICAL

14"x168" Norton Plain Type C. 1942.
14"x48" Norton Pl. Type C. Hyd. 1941.
14"x36" Landis Univ. Type C. Hyd. 1942.
12"x36" Norton Universal. 1941.
6"x18" No. 10 Brown & Sharpe Pl. Hyd. 1943.

GRINDERS—INTERNAL

No. 24-36 Bryant Hyd. 1943.
No. 172 Heald Hyd. Gap. 1940.
No. 81 Heald Plain Hyd. 1940.
No. 73 Heald Airplane Cyl. 1942.
72AS Heald Plain Hyd. 1942.
No. 50 Heald Hyd. 1943.

GRINDERS—THREAD

No. 35L Excello Precision. 1943.
No. TG-615 Jones & Lamson. 1947.

GUN BARREL MACHINES

No. 410 Barnes Deep Hole Drill. 1943.
No. ½Bx50 P&W Reamer. 1942.
No. ½Bx30 P&W Reamer. 1942.
No. ½Bx50 P&W Rifler. 1942.

LATHES—ENGINE

20"x"06" American G.H.
20"x240" LeBlond. 1941.

LATHES—PRODUCTION

No. 3 FU Foster "Fastermatic". 1942.
14"x42" Monarch "Manumatic". 1941.
"x108" Lo-Swing Semi-Auto. 1942.
No. R-14 Lo-Swing. 1911.

LATHES, TURRET

No. 4A Warner & Swasey. 1942.
No. 1A Warner & Swasey. 1938.
No. 5-B Acme Universal. 1947.
No. 1H-6 Libby Universal. 1942.
No. 3 Bardons & Oliver. 1940.

MILLS, PRODUCTION

No. 36-36 Cincinnati Hydro. 1942.
No. 5-48 Cincinnati Hydromatic. 1942.
No. 118 Cincinnati. 1942.
No. 1-14 Kent Owens Hyd. 1942.
No. 00 Cincinnati Plain. 1943.
U.S. Multi-Millers. 1942.

MILLS, THREAD

6"x6" LT Lees Bradner. 1942.

MISCELLANEOUS

48"x½" Niles Plate Straightener.
No. 616 Cleveland Rigidturner. 1942.

PRESSES

55 Ton Niagara, S.S. Late.

SHAPERS

24" Rockford M.D. Hyd. Latest.
20" Cincinnati Plain. Late.
6" Pratt & Whitney Vertical. 1942.

WELDERS

100 KVA Taylor-Winfield Seam. 1943.

Write for latest stock list

INDIANAPOLIS Machinery & Supply Co.

1961 S. Meridian St. . . Indianapolis, Indiana

HORIZONTAL BORING MILLS

2½" Cleveland, long bed
3" Rockford
Rockford 2 spdl., 60" index table
4" Niles Bement Pond floor type
4½" bar Lucas, No. 33
5" bar Jones planer table type

VERTICAL BORING MILLS

24" Bullard vertical turret lathe
38"-44" Niles vertical turret lathe
51" Bullard, old style
52" King
84" Gisholt
100" Niles Bement Pond extra heavy
6 spdl. No. 5D Moline cylinder

GEAR HOBBERS

No. 8H, 12H, 16HS & 18H Gould & Eberhardt
No. 130 Cleveland Rigidhobber
Nos. 1 & 5A Lees Bradner
No. 7125A Fellows gear shaper

GRINDERS, CYLINDRICAL

6"x18", 10"x18" & 14"x36" Landis hydraulic
6"x18", No. 10 & 6"x32", No. 11 B & S mechanical
10"x24" & 16"x72" Landis mechanical
10"x36" Norton hydraulic semi-automatic
10"x18", 10"x30" & 10"x50" Norton mech.
14"x36" Landis hydr. univ.

GRINDERS, SURFACE

Nos. 10 & 16A2 Blanchard rotary
12" & 16", No. 22 Heald rotary
8" Pratt & Whitney rotary (tub)
8"x24" No. 34 Abrasive vertical
14"x36" Pratt & Whitney vertical
8"x24", No. 78 Wilmarth & Morman
8"x22", No. 3 Abrasive

GRINDERS, TOOL & CUTTER

Oliver template tool bit
No. 1 Sellers
Gisholt for lathe & planer tools
18" Whitney wet tool
No. 13 Brown & Sharpe univ.

ENGINE LATHES

16"x10' American
18"x8' Rockford
26"x120" centers Wickes
30"x16' Lebland
36"x108" centers Bridgeford
40"x80" centers Lebland

MILLERS, KNEE TYPE

No. 2 Mfg. Milwaukee
No. 2 Cincinnati plain
No. 2 Cincinnati vertical
No. 2AS Milwaukee plain
No. 3 Van Norman duplex
No. 3 Osterlein
Nos. 1-12 & 1-18 Cincinnati production

SHAPERS & PLANERS

20" G. & E. shapers
24" Columbia univ. shaper
16" Bement Miles slotter
30"x24"x6' Liberty openside planer
36"x36"x8' Gray planer
48"x48"x12' Cleveland openside planer

MISCELLANEOUS

AUTOMATIC—⅞"—1-1/16" Cleveland 4 spdl.
BROACH—15 ton No. V3 Lapointe
DRILL—24", No. D4 Colburn heavy
DRILL—20" & 24" Barnes AGSO
DRILL—6' Dreses radial, old style
HAMMER—No. 5N Nazel pneumatic
HEADER—⅜" No. 30 ODSS Waterbury Farrel
KEYSEATER—Nos. 4 & 5 Mitts & Merrill
LAPPER—No. 26 Norton Hyprolap
MARKING MACHINE—No. 25 Schmidt
OIL GROOVER—No. 1 Fischer
PIPE MACHINE—2" Landis
PRESS BRAKE—No. 40-8 Dual
PRESS—1000 ton Bliss coining
RIVETER—Nos. 3A & 5A High Speed
TAPPER—Baush radial arm
TAPPER—14 spdl. No. E5 Natco

MILES MACHINERY CO.
Box 770 SAGINAW, MICH.

MAKE YOUR DOLLARS *Count*

GRINDERS

NORTON 24"x240" Cylindrical Grinder, Type "A"
NORTON 10"x72" Type "C" Hydraulic Plain Cylindrical (1941 machine)
HEALD #72AS Internal Grinder (1947 vintage) with chuck, face plates
NORTON #1 Tool & Cutter Grinder (late type)—with workhead and footstock—attachments.
NORTON #2 Universal Tool & Cutter Grinder—(1941 vintage)
BROWN & SHARPE #2 M.D., Universal Grinder 12"x30" cap.—with attachments.
BROWN & SHARPE #4 M.D., Universal Grinder 12"x60" cap.—with attachments

LATHES

LEBLOND #2, GUN BORING LATHE (1942 vintage)—used on 37 MM shells—swing over bed 18½"—hole thru spindle 5⅛"—10' stroke—(excellent condition)

SENECA FALLS 8"x108" Lo-swing Lathe (1942 vintage)—swing over ways 13½"—over carriage 10"—two 30" power feed carriages—template.

NILES-BEMENT-POND 48"x30' ctrs. QCG, Gr. Hd. Heavy Duty A.C. motor drive—2 carriages—taper attachment—power rapid traverse—16 speeds 2.04 to 90 RPM—(late type).
MONARCH 28"x72" ctrs. Model "N", 16-Speed, Gr. Hd. 22½" swing with Monarch auto. sizing controls (late).
AMERICAN 18"x8' and 18"x8', 12-Speed, Gr. Hd. Pan Bed, M.D.
HENDEY 12"x30" ctrs., 18-Speed, Gr. Hd. Motor-in-base—(1942 vintage)—Timken brg.—collets—taper attachment—actual swing 14½"—1000 RPM
HENDEY 12"x30" ctrs., 24-Speed, Gr. Hd., Motor-in-base—(1942 vintage)—Timken brg.—actual swing 14½"
LODGE & SHIPLEY 14"x30" ctrs., Motor-in-base, 12-Speed Selective gr. hd. (1943 vintage)—with Taper attachment.

TAPPING MACHINES

ALLEN ¾" Type "WT" MD Ball bearing—overhang 12"—#3 Morse Taper
HASKINS #1HA MD 3/16" capacity mild steel, ½" in brass.
BAKEWELL #1 Precision Tapper capacity 8/32" to ⅞", MD (late type) #2 Morse

MISCELLANEOUS

LINDE OXWELD Type CM-12 Oxy-acetylene Cutting Machine, with line tracer and circle cutting attachment.

CAMPBELL #2 Nibbler, ¾" cutting capacity.

Send for our catalog "The Plant That Answers 1001 Machine Tool Problems".

Botwinik Brothers
of Mass. Inc.

IMMEDIATE DELIVERY

Lucas #43 Precision Boring Mill, 5" Bar. Table 36"x72", 16 speeds. A.C. M.D.

Norton Hyprolap #26, A.C. M.D.

Pratt & Whitney 14"x36" Surface Grinder New 1943

Libby 4H—Sliding Bed Turret Lathe, 12½" Thru Spindle, 84" Swing

Gorton #3L Three Dimensional Pantograph 1942 A.C. M.D.

BLISS Power Presses, all sizes and types

NILSON & BAIRD FOUR SLIDES

National Machinery Exchange, Inc.
128-138 Mott St., New York 13, N. Y.

EVERY ITEM GUARANTEED
All Late Type

72" King Vert. Boring Mill 1942
7" Barrett Horiz. Boring Mill, Floor Type
#28/120 Cincinnati Vert. Hydrotel Mill, 3 Spdl.
#28/60 Cincinnati Vert. Hydrotel Mills, 3 and 4 Spdl. (2)

12"x54", 16"x54", 28"x48", 28"x120" Monarch Lathes, all built after 1942.
14' Niles Vert. Boring Mill
Bullard Multaumatic 12" 6 Spdl. Type D
36" Gould & Eberhardt Shaper '41
60" Bickford Vertical Boring Mill
75 Ton Henry & Wright Dieing Press, '41

150 Ton Cleveland #60-D-84 Punch Press Dbl. Crank, 16" stroke, 46½x 86" Bed.
200 Ton Verson, #40FS, Punch Press, 30" stroke, 35 x 37 bed.
400 Ton Verson, #54—102 Punch Press, 20" stroke, 54 x 102" bed area.

Cone Automatic 2¼" 6 Spdl., 1941
#2 Cincinnati Tool & Cutter Grinders (2)
Planers 48x48x10' Cin. Dbl. Housing
Barnes Deep hole Drill, Horiz., 2 Spdl.
#R-14 Lo-swing Production Lathe
#5 Cincinnati Horizontal Mill
#2H Kearney & Trecker Vertical Mill

#1½ Yoder Roll Former, 8 Spdl, 1½" Shaft dia. x 6½" Max. length flat strip, latest, w/cutoff
60" McKay Roller Levellers, ¼" to 2" Cap. and ½" to 2" Cap., armor plate (2)

PAULS MACHINERY COMPANY
6111 Vermont Ave. Detroit 8, Mich.
Phone: TYLER 7-6300

CARBON STEEL BARS FOR SALE

190#—⅞" hex, AMS 5024
1840#—1⅛" hex, low alloy, SAE 8740
407#—1⅛" hex, low alloy, SAE 8740
916#—1¼" hex, SAE 1137
1206#—1 3/16" hex, low alloy, SAE 8735
13509#—1⅜" hex, low alloy, SAE 9310
7075#—1-1/16" hex, SAE 1137
2148#—1¼" hex, SAE 1137
99#—1⅛" round, SAE 1137
265#—1½" round, SAE 1137
332#—2⅛" round, low alloy, AMS 6440
2167#—6" round, low alloy, SAE 9310
704#—6" round, low alloy, SAE 9314
156#—6¼" round, low alloy, SAE 4640
520#—8" round, low alloy, SAE 9314

JOHNSON MACHINERY CO.
59 Edison Place, Newark 2, N. J.
Phone: Mitchell 3-7608-09-10

FOR SALE

PUTNAM LATHE

79"x14'—79¾" swing over the ways—77¾" over the carriage—cone drive—motorized—very good condition—$15000.00.

O. S. WALKER COMPANY, INC.
WORCESTER 6, MASS.

Production Equipment For Sale or Trade
1 Seneca Falls Model R Automatic Lathe.
1 Seneca Falls Model U Automatic Lathe.
2 Seneca Falls Model 4" Automatic Lathe.
1 Lipe Rotaway Carbo-Lathe.
6 spindle gang drill 2x12 ft. table.
3 electric ovens. 1 Hayslene Degreaser.
Require 40 to 90 tons inclin-bia presses, engine lathes and No. 3 universal Millers.
SPELCHAKE MACHINERY CO.
947 Pritchard Ave., Winnipeg, Man.

HARD-TO-FIND HEAVY MACHINERY and SHEET METAL EQUIPMENT

IMMEDIATE SHIPMENT *from* ORIGINAL LOCATION

SHEARS

CLEVELAND type 443 Vert. Trimming; 1½" stroke
GARRISON 132" Gate; cap. ¼"
LEWIS #5½ Alligator; 3½" stroke
LONG & ALLSTATTER type A double geared Gate
LONG & ALLSTATTER Type B double head copying
MACKINTOSH HEMPHILL Bar; stroke 3½"

PRESSES—Hydraulic

BEMENT MILES (upward) 36" stroke
BETHLHEM (Downward) 16" stroke
BETHLHEM (Downward) Flanging, 60" stroke
MACKINTOSH-HEMPHILL (upward) 30", 36", 60" strokes

PRESSES—Power

BLISS No. 10A, 450 tons, 12" stroke
BLISS No. 15, 1200 tons, 20" stroke
FERRACUTE 100 ton cap., 2" stroke
TOLEDO No. 88 single crank, 16" stroke

PUNCHES—Vertical, Open Gap

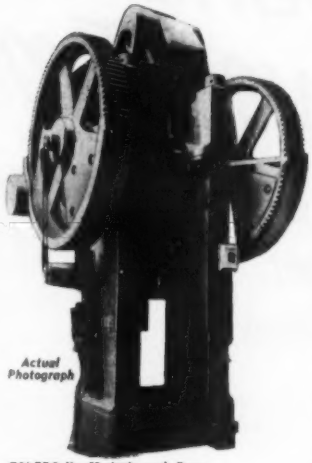
CLEVELAND type EF, 1½" stroke
CLEVELAND Type C, 1½" stroke
CLEVELAND type C, 1¾" stroke
COVINGTON No. 2, 54" throat, 2" stroke
HILLES & JONES No. 2, 1½" & 1¾" strokes
HILLES & JONES No. 3, 2½" stroke
LONG & ALLSTATTER No. 2, 1½" stroke
LONG & ALLSTATTER No. 3, 1½, 1¾" stroke
MACKINTOSH-HEMPHILL No. 3, stroke 2½"
MASSILLON No. 5, 1¾", 2" strokes
WILLIAMS & WHITE No. 17, cap. 1" x ⅝"

PUNCHES—Multiple, Open Gap

CLEVELAND 500 ton Vert. 30" IX; 6" stroke
CLEVELAND 500 ton Vert. 30" IX, 3" stroke
CLEVELAND 24" Aggle, 2½" stroke

PUNCHES—Multiple

CLEVELAND No. 1, ⅝" cap. 6" stroke
CLEVELAND 3" stroke; 120° throat
COVINGTON 10'2", stroke 6"
SOUTHWARD 400 ton, 7" stroke
THOMAS No. 20, 3" stroke, 35" throat
THOMAS No. 20, 3" stroke
WILLIAMS & WHITE Vert. 6" stroke, 36" throat



Actual Photograph

TOLEDO No. 88 single crank Press

ASK FOR OUR ILLUSTRATED CATALOG

PUNCHES—Double Head, Open Gap

CLEVELAND type C, 1½" stroke, 26" throat
HILLES & JONES No. 3, 1⅝", 1¾", 2" strokes
LONG & ALLSTATTER Size "B"; cap. 2¼" dia., 1¼" thick

PUNCHES—Horizontal

CLEVELAND Kyle A.L., 1¾" stroke
HILLES & JONES No. 2, 1½" stroke
HILLES & JONES No. 2, 1¼" stroke
HILLES & JONES No. 3, 1⅝" stroke

ROLLS—Bending & Straightening

CLEVELAND Straightening; cap. ⅜"x4"

SLOTTERS

DILL 18" stroke
NEWTON 18" stroke
PRATT & WHITNEY 6½" Vertical

HAMMERS—Forging, Steam, Single Frame

ERIE, cap. 2500#
ERIE No. 1135, cap. 1100#
MONIGHAN "American" #610, 1100# cap.

HAMMERS—Forging, Steam, Double Frame

CHAMBERSBURG 600#, 800#, 1500#
CHAMBERSBURG 6800#, Nordel "E"
ERIE 4000#

FORGING MACHINES

AJAX horiz., 1½", 2", 4", 5"
AJAX Auto. rivet forging
AJAX Lever forging, size 43"

PARTIAL LIST

Bulldozers, air compressors, hydraulic pumps, Axle Lathes, Planers, Saws, Welders, Turbines, Turbo Generators, Testing Machines, and a large quantity of SMALL TOOLS such as chain blocks, reamers, drills, cutters, etc.

McKEES ROCKS INDUSTRIAL ENTERPRISES

Nichol Avenue — ***Phone*—FEderal 1-0746** — **McKees Rocks (Pittsburgh), Pa.**

ALL LATE TYPE

Lathe, Engine, Mackintosh-Hemphill, 72"/110"x30' centers, factory rebuilt, like new; Weight 90 Ton.

Turret—Midland #5, bar & chucker
Turret—Oster #601WD, 1½" collet
Shear—Sq., Famco Power 36"x18 G, New
Shear—Sq., Pexto 10'x10 G.
Shear—Rotary—Quickwork #50A, Circle Cutter & Slitter 48"x¾"
Rolls—Forming, Farnham 6' (airplane)
Spot Welder—75 KVA
Induction Heater—Lepel 7½ KW
Thread Mill—Morey 12"x10' centers, Int. & External.

KINGS COUNTY MACHINERY EXCHANGE

408 Atlantic Ave., Brooklyn, N. Y.
TRiangle 5-5237—Dept. "A"

AVAILABLE

2—24" FELLOWS HYDROLAPPING MACHINES, SERIAL #23133 AND #23137, BUILT 1942 OR LATER; For lapping Spur and Helical, External and Internal; Capacity 24" minimum, 6" maximum.

GENERAL SALES AND SERVICE
First National Bank Bldg., Peoria 2, Ill.

SIMMONS ENGINEERED Machine Tool REBUILDING NEWS

SIMMONS MACHINE TOOL CORPORATION • MAIN OFFICE AND PLANT 1750 N BROADWAY, ALBANY, N. Y.

Extension Type BORING MILL

14-20' BETTS VERTICAL with center boring head and two swivel heads on rail, 108" height under rail.

Have Your Machine Tools *Rebuilt the Simmons Way*

1.) Take a *physical* inventory of your machine tools, particularly the heavy, hard-to-replace ones.
2.) Select those in need of rebuilding or modernizing that can be spared temporarily.
3.) Call on Simmons to see the program through by *Engineered Rebuilding* in the world's largest, best-equipped plant.

Write Today for a Complete Current Stock List Of Simmons Engineered-Rebuilt Machine Tools.

NEW YORK OFFICE—50 EAST 42ND STREET
PHILADELPHIA REPRESENTATIVE—PHONE—VICTOR 8-3133
PITTSBURGH REPRESENTATIVE—PHONE—PENHURST 1-3700

Backstand Method Saves Time!

Toledo Steel Tube Co. saves 2 hours per operator per day in finishing department

The Toledo Steel Tube Co. uses the backstand belt method to remove burrs and grip marks from the tubing. This company points out the following advantages of the backstand belt method over the set-up wheel method:

1 Time is not lost in making set-up wheels. Formerly the operators were given 2 hours a day for making their set-up wheels.

2 One backstand belt will outlast 4 to 5 set-up wheels for this application.

3 Belts maintain a flat surface for the grinding and polishing operation, whereas set-up wheels became rounded and needed dressing from time to time.

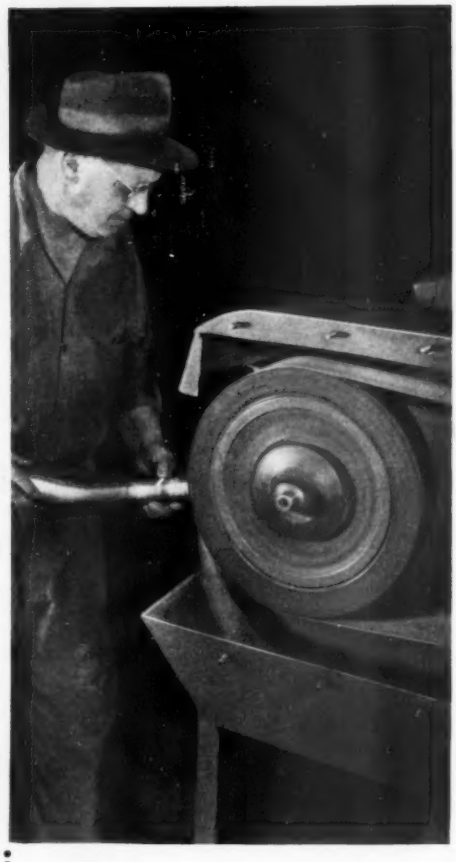
4 The uniform grit on the belts gives a much better finish on the tubes than did the rolled-on grit of the set-up wheels.

Manufacturers of hundreds of different industrial and consumer items have proved that the backstand belt method is more efficient and more economical than the set-up wheel.

If you are grinding, polishing or finishing flat or contoured surfaces, cast pieces, stamped pieces or forged pieces, the backstand belt method can help you with your production problems.

To learn more about the many advantages of the backstand belt method, write today for our free booklet.

We recommend buying through your industrial distributor



MAIL THIS COUPON TODAY

Please send me the booklet "Facts about Backstand Belt Grinding and Polishing."

Name _____

Title _____

Firm _____

Address _____

City _____ *Zone* ____ *State* _____

Armour's abrasive belts are only part of a complete line of abrasives built to rigid quality specifications. There are sheets, rolls, discs and other more specialized shapes.

ARMOUR *Coated Abrasives Division*

SHEETS • ROLLS • BELTS • DISCS

Armour and Company
North Benton Road • Alliance, Ohio

INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives, Coated 24-25, 51, 173, 240

Accessories & Attachments (Machine Tool) 46, 56, 177, 188, 192, 200, 214, 219

Arbors & Mandrels 177

Bearings 27, 210, 246

Bending Machines 147

Books, Technical 213, 224, 226

Boring, Drilling & Milling Machines (Horizontal) ..... 3rd Cover, 14-15, 61

Boring Machines, Internal ..... 2nd Cover

Boring & Turning Machines (Vertical) 14-15, 37, 61

Broaching Machines 79, 128, 169

Cam, Milling Services 175, 222

Centering Machines 147, 226

Chucks 204, 207, 216, 220

Cleaning & Drying Machines & Supplies 54

Collets 57

Coolant Systems, Filters & Supplies 54

Cut-Off Machines; Sawing Machines 58, 147, 178, 213, 224

Dressers, Grinding Wheel 179

Drilling Machines 40-41, 59, 60, 61, 65, 76, 84, 125, 153, 159, 160, 170, 224

Dust Collectors 206

Engineering & Production Services 168, 183, 185

Fabricating Methods & Services 175, 188, 222

Fasteners 155, 179, 195, 209

Floor Drying Compounds 196

Gages & Instruments 30, 34, 52, 64, 74, 126, 132, 206, 210, 225, 226

Gear Cutting Machines 3, 6-7

Gears, Speed Reducers, Motor Reducers 217, 218

Gear Testers 3, 6-7

Grinders—Cutter & Tool 166, 220

Grinding Machines—Production— 2nd Cover, 4-5, 12-13, 17, 28, 33, 34, 66, 145, 205, 222

Grinding Wheels 18-19, 24-25, 51, 66, 130, 162, 173

Heat Treating Equipment & Supplies 208, 218

Honing Machines 67

Hydraulic & Pneumatic Parts & Equipment 31, 54, 83, 161, 196, 214

Jig Borers 59, 171, 204

Lapping Machines 145

Lathes, Automatic 49, 191

Lathes, Engine 26, 29, 42-43, 61, 63, 69, 78, 202, 211, 222

Lathes, Turret 22-23, 197, 211

Lubricants, Cutting Fluids, Quenching Oils & Solvents 53, 60, 149, 226

Marking Machines & Tools 68, 208, 224

Materials, Cutting & Forming 167, 213

Materials of Manufacture ..... 4th Cover, 183, 212, 242

Materials Handling Equipment 198

Mechanical Parts & Equipment 200, 219

Millers, Die Sinkers, Profilers 4-5, 8-9, 20-21, 45, 61, 200

Molds 210

Motors, Electrical 55

Oil Purifiers 201

Planers 14-15

Polishing & Buffing Machines 62

Power Transmission 27, 204

Presses, Forging & Forming Equipment & Supplies 48, 70, 161, 187, 188, 196, 210, 214, 221, 222, 224

Pumps, Circulating 168, 222

Riveting Machines 222

Safety & Welfare Equipment 215

Saw Blades 58, 126, 214, 223

Screwdriving Machines 172

Screw Machines; Chucking Machines 47, 50, 174, 186

Shapers, Slotters, Keyseaters 86, 193, 220

Special Machine Tools 172

Spindles, Machine 214

Stampings 222

Tapping Machines 40-41, 84, 125, 153, 160

Thread Cutting Machines 10-11

Thread Milling Machines 213

Tools, Cutting 16, 32, 46, 64, 72, 79, 157, 175, 176, 185, 188, 189, 202, 216, 224, 226

Tools, Hand 180, 223

Tools, Measuring 206

Tools, Portable 38-39, 56, 151, 165, 194

Transportation 199

Used & Surplus Equipment 230-239

Vibration Control 163

Vises 46, 198, 200, 204, 216

Welding & Cutting, Brazing & Soldering Equipment & Supplies 202, 203, 227

THIS "HAT TRICK" HELPS IMPROVE

MACHINABILITY

● "Hat trick?" Union Drawn Machining Specialists do it often—put on their hats and hit the road—digging for every fact about the "whys" and "hows" of steel MACHINABILITY.

They visit hundreds of customers' plants annually, studying the performance of various steels under actual operating conditions. What's more, they cut up tons of steel every year in Republic's machining laboratories.

Their results: an unsurpassed knowledge of MACHINABILITY—a fund of information that has made Union Drawn Steel the nation's "MACHINABILITY Headquarters" for over 60 years.

Every fact uncovered . . . every clue chased down . . has been translated into improved steelmaking and finishing. That's why in today's Union Cold Finished Steels you get *uniformity* throughout bar after bar and shipment after shipment . . . remarkable freedom from tool-wearing elements . . . smooth, bright machined surfaces . . . top production efficiency . . . low unit parts cost.

Union Drawn Field Representatives are ready now to put on their hats for a visit to your plant. For their assistance on any problem involving steel MACHINABILITY, set-ups or tooling, just write:

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
Export Dept.: Chrysler Building, New York 17, N. Y.

A NEW STEEL...A NEW PRODUCTION OPPORTUNITY

It's Union Drawn's new Bessemer steel—B-1113-X. Where your equipment and the design of your parts will accept higher speeds—where longer tool life is practical—B-1113-X may stimulate production rates. Your Union Drawn Field Service Man can tell you in a hurry. Write, wire or 'phone.

Republic UNION® COLD DRAWN STEELS

REPUBLIC STEEL

Free-Machining Bessemer, Alloy and Enduro Stainless Steels • • Union Cold Drawn Special Sections
Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shafting)

ADVERTISERS INDEX

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Acromark Co.	224
Adams Co.	218
Air Reduction	227
Allis-Chalmers Mfg. Co.	55
Allison Co.	175
Alvord Polk Tool Co.	224
American Air Filter Co.	206
American Brass Co.	183
American Optical Co.	215
American Tool Works	29
Armour & Co. & Subsidiaries	240
Armstrong-Blum Mfg. Co.	58
Armstrong Bros. Tool Co.	46
Ball & Roller Bearing Co.	210
Bath Co. Inc. John	64, 157
Bay State Abrasive Products Co.	173
Behr-Manning Corp.	24-25
Black & Decker Mfg. Co.	151
Blanchard Machine Co.	28
Brad Foote Gear Works	217
Brown & Sharpe Mfg. Co.	52
Bryant Chucking Grinder Co.	33, 34
Bryant Machinery & Engrg. Co.	59
Buck Tool Co.	220
Bullard Co.	37
Carborundum Co.	51
Carlton Machine Tool Co.	76
Carpenter Steel Co.	213
Carroll & Jamieson Machine Tool Co.	202
Cimcool Division, Cincinnati Milling Machine Co.	53
Cincinnati Bickford Tool Co.	65
Cincinnati Gear Co.	218
Cincinnati Gilbert Machine Tool Co.	3rd Cover
Cincinnati Lathe & Tool Co.	69
Cincinnati Milling Machine Co.	4-5
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	86
Clearing Machine Corp.	187
Cleereman Machine Tool Co.	59
Cleveland Crane & Engineering Co	221
Cleveland Twist Drill Co.	32
Colonial Broach Co.	79
Columbus Die Tool & Machine Co.	188
Cone Automatic Machine Co.	47
Conner Tool & Cutter Co.	185
Consolidated Machine Tool Corp.	61
Continental Tool Works	72
Cross Co.	125
Crucible Steel Co. of America	164
Danly Machine Specialties Inc.	70
Davis & Thompson Co.	200
Davis Keyseater Co.	220
Dayton Rogers Mfg. Co.	222
DeLaval Separator Co.	201
Delaware Tool Steel Corp.	208
Delta-Rockwell Power Tool Div.	159
Desmond Stephan Mfg. Co.	216
Detroit Power Screwdriver Co.	172
DeVlieg Machine Co.	171
Disston & Sons Inc., Henry	223
Dodge Mfg. Corp.	204
Donovan Mfg. Co.	200
Eagle Picher Sales Co.	196
Eastern Machine Screw Corp.	226
Eisler Engineering Co., Inc.	222
El Paso Chamber of Commerce	208
Ex-Cell-O Corporation	72
Federal Products Corp.	132
Fellows Gear Shaper Co.	6-7
Felters Co.	163
Ferracute Machine Co.	222
Foote-Burt Co.	128
Fosdick Machine Tool Co.	60
Fray Machine Tool Co.	200
Gallmeyer & Livingston Co.	220
Gardner Machine Co.	17
Giddings & Lewis Machine Tool Co.	14-15
Geometric Tool Co.	190
Gisholt Machine Co.	191, 197
Gleason Works	3
Gross & De Leeuw Machine Co.	174
Grant Mfg. & Machine Co.	222
Greenfield Tap & Die Corp.	189
Grob Brothers	224
Grip Nut Co.	179
Hamilton Tool Co.	160
Hannifin Corp.	161
Hardinge Brothers, Inc.	57
Hartford Special Machinery Co.	153
Heald Machine Co.	2nd Cover
Hebert Equipment Co.	226
Hendey Machine Co.	193
Henry & Wright Div. of Hartford Empire Co.	214
Hirschmann Co., Carl, (Schaublin Div.)	62
Holman Reamer Co.	224
Honan Crane Corp.	54
Hones, Inc., Charles A.	218
Hyatt Bearings Div., Gen. Motors Corp.	246
J & S Tool Co.	179
Jacobs Mfg. Co.	207
Jarvis Co., Charles L.	176
Jones & Lamson Machine Co.	49
Kearney & Trecker Corp.	20-21
Keller Tool Co.	56
Kempsmith Machine Co.	177
Kingsbury Machine Tool Corp.	40-41
Kitzman Mfg. Co.	210
Kux Machine Co.	175
L-W Chuck Co.	213
Landis Machine Co.	10-11

It's time we got *working* mad!

As we listen to the latest insults from Moscow, we're likely to get fighting mad.

Instead, we'd better use our heads and get *working* mad.

It is clear by now that Stalin and his gang respect just one thing—strength. Behind the Iron Curtain they've been building a huge fighting machine while we were reducing ours. Now we must rebuild our defenses—*fast*.

As things stand today, there is just *one* way to prevent World War III. That is to re-arm—to become strong—and to stay that way!

This calls for better productivity all along the line. Not just in making guns, tanks and planes, but in turning out civilian goods, too.

Arms must come first. But we must produce arms *at the same time* we produce civilian goods.

We can do this double job if we all work together to turn out more for every hour we work—if we use our ingenuity to step up productivity.

All of us must now make sacrifices for the common good. But we're working for the biggest reward of all —*peace with freedom!*

THE BETTER WE PRODUCE THE STRONGER WE GROW

A PUBLIC SERVICE PROJECT · THE ADVERTISING COUNCIL

FOR A FREE COPY OF "THE MIRACLE OF AMERICA"

MAIL THE COUPON to Public Policy Committee, The Advertising Council, Inc., Dept. B.P., 25 West 45th Street New York 19, N. Y.

Name .....

Address .....

.....

McGRAW-HILL PUBLISHING COMPANY

ADVERTISERS INDEX

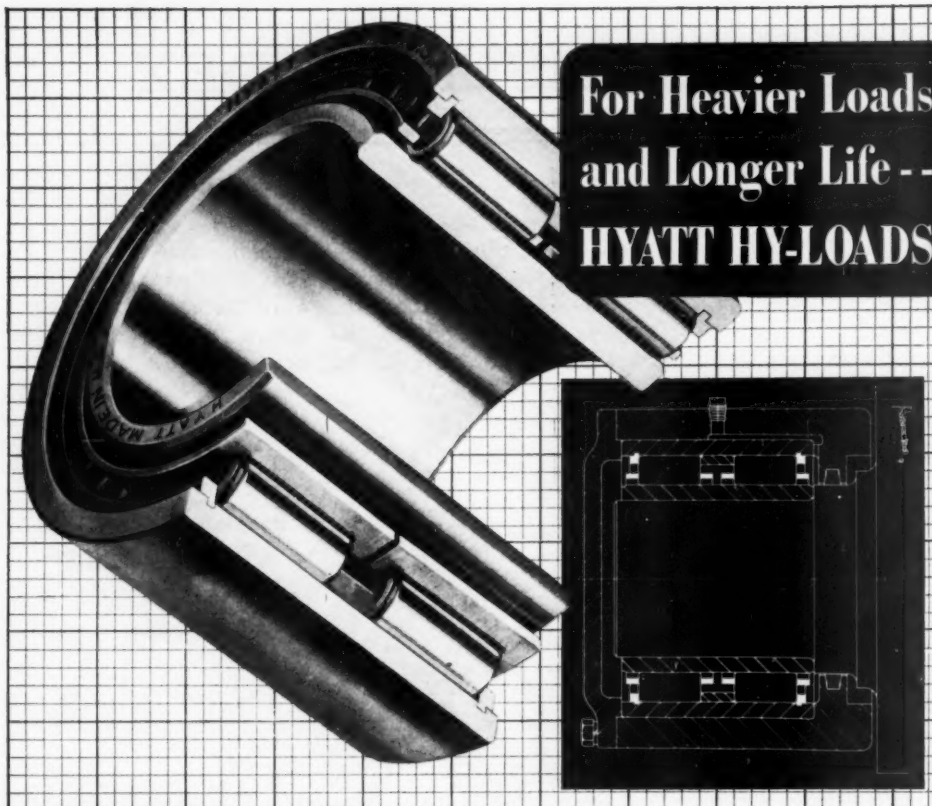
	Page
Landis Tool Co.	12-13
Lavallee & Ide, Inc.	202
LeBlond Machine Tool Co., R. K.	42-43
Leland-Gifford Co.	224
Link Belt Co.	27
Linley Brothers Co.	204
Lipe Rollway Corp.	192
Lodge & Shipley Co.	26
Logansport Machine Co.	214
Luers, J. Milton	214
Lufkin Rule Co.	206
M & N Machine Tool Works	210
Mall Tool Co.	194
Master Manufacturing Co.	219
Mattison Machine Works	205
McGraw-Hill Book Co., Inc.	224, 226
Mead Specialties Co.	196
Meisel Press Mfg. Co.	218
Micromatic Hone Corp.	67
Millers Falls Company	165
Monarch Machine Tool Co.	63
Morris Machine Tool Co.	84
National Acme Co.	186
New Britain Gridley Machine Co.	50
Nicholson File Co.	180
Noble & Westbrook Mfg. Co.	68
North Bros. Mfg. Co.	198
Norton Co.	18-19
Oilgear Co.	169
Oliver Instrument Co.	166
O'Neil-Irwin Mfg. Co.	196
Parker-Kalon Corp.	209
Pines Engineering Co., Inc.	147
Pioneer Engineering & Mfg. Co.	168
Pioneer Pump & Mfg. Co.	168
Pope Machinery Corp.	214
Pratt & Whitney Div., Niles Bement Pond Co.	78
Railway Express, Air Express Div.	199
Randall Co., Inc., Frank E.	226
Ready Tool Co.	214
Rivett Lathe & Grinder Inc.	31, 222
Robertson Mfg. Co.	130
Ruthman Machinefy Co.	222
Sales Service Machine Tool Co.	178
Schmidt Inc., George T.	208
Schnell Tool & Die Corp.	222
Sciaky Bros., Inc.	203
Severance Tool Industries Inc.	216
Sheffield Corp.	74
Shore Instrument & Mfg. Co., Inc.	210
Sibley Machine & Foundry Corp.	170
Simonds Abrasive Co.	162
Simonds Saw & Steel Co.	167
Skilsaw Inc.	38-39
Socony Vacuum Oil Co., Inc.	149
South Bend Lathe Works	211
Stahl Gear & Machine Co.	218
Standard Conveyor Co.	198
Standard Pressed Steel Co.	155
Standard Tool Co.	16
Starrett Co., L. S., The	126
Steelweld Machry. Div. Cleveland Crane & Engineering Co.	221
Stuart Oil Co., D. A.	226
Sundstrand Machine Tool Co.	44-45
Sundstrand Magnetic Products Co.	204
Taft Peirce Mfg. Co.	145
Texas Co.	80
Timken Roller Bearing Co., Steel & Tube Div	4th Cover
Tomkins Johnson Co.	83
Union Drawn Steel Div., Republic Steel Corp.	242
V & O Press Co. Div. of Hartford-Empire Co.	224
Van Keuren Co.	30
Van Norman Co.	8-9
Vlier Mfg. Co.	195
Walker Co., Inc., O. S.	216
Waltham Machine Works	213
Warner & Swasey Co.	22-23
Webber Gage Co.	225
Weldit Inc.	202
Wickman Manufacturing Co.	66
Wilson Mechanical Instrument Co.	226
Wilson Co. K. R.	48
Youngstown Sheet & Tube Co.	212

SEARCHLIGHT SECTION
(Classified Advertising)

EMPLOYMENT	Page
Positions Vacant	229
Selling Opportunities Offered	229
Employment Agency	229
Employment Service	229
SPECIAL SERVICES	
Contract Work	230
Arrow Safety Device Co.	230
General Pattern Works	230
Hampton Roads Manufacturing Co.	230
BUSINESS OPPORTUNITIES	
Offered	230
EQUIPMENT	
(Used or Surplus New) For Sale	230-232
WANTED	
Equipment	229, 230

ADVERTISERS INDEX

Aaron Machinery Co.	235
Bennett Machinery Co.	232
Botwinik Bros. of Mass., Inc.	238
B. D. Brooks, Inc.	236
Brownell Machine Tools, Inc., Hazard	234
Davies & Son, Inc.	236
Dony Machinery Co., D. E.	234
DuPont de Nemours & Co., E. I.	229
Eastern Machinery Co.	234
Fairfield Equipment Co.	230
Falk Machinery Co.	231
Gaumselius Annonsbyra	227
General Sales and Service	230, 235
Graff Machine Tool Co.	236
Hayden Machinery	230
Hill-Clarke Machinery Co.	232
Holden Co., The A. F.	227
Hyman & Sons, Joseph	234
Indianapolis Machinery & Supply Co.	237
J. & L. Machinery & Supply Co.	232
Johnson Machinery Co.	238
Judge & Co., Inc., Frank M.	235
Kings County Machinery Exchange	235
Lake Machinery Co.	232
Land, Inc., L. J.	236
Luria Brothers & Co., Inc.	230
McDonald Machinery Co.	234
McKees Rocks Industrial Enterprises	239
Miles Machinery Co.	238
Morey Machinery Co., Inc.	236
National Machinery Exchange	238
O'Brien Machinery Co., The	237
O'Connell Machinery Co.	234
Osborne & Sexton Machinery Co.	237
Paul's Machinery Co.	238
Rice & Co., Inc., Robert W.	230
Sargent Engineering Inc.	224
Simmons Machine Tool Corp.	239
Spelchake Machinery Co.	238
Stripmatic Products, Inc.	230
Tris-Kris Co., Inc.	236
Triplex Machine Tool Corp.	233
Wabash Employment Agency	229
Walker Co., Inc., O. S.	238
West Penn Machinery Co., Inc.	232
Wigglesworth Machinery Co., Inc.	236



For Heavier Loads and Longer Life -- HYATT HY-LOADS

The cut-away Hyatt Hy-Load Roller Bearing illustrated is the A-TS Duplex Type, 6200 Series. Duplex type Hy-Load bearings are much wider and have much greater load capacity than other standard series bearings of the same bore size. Two roller-separator sets are assembled with the outer race as a unit. The roller sets are spaced by a steel ring centered in the bore of the outer race.

While Duplex Bearings can sustain extremely heavy loads, the allowable deflection of the shaft is usually a limiting factor. The extra capacity is therefore utilized, in most cases, to meet a greater life requirement.

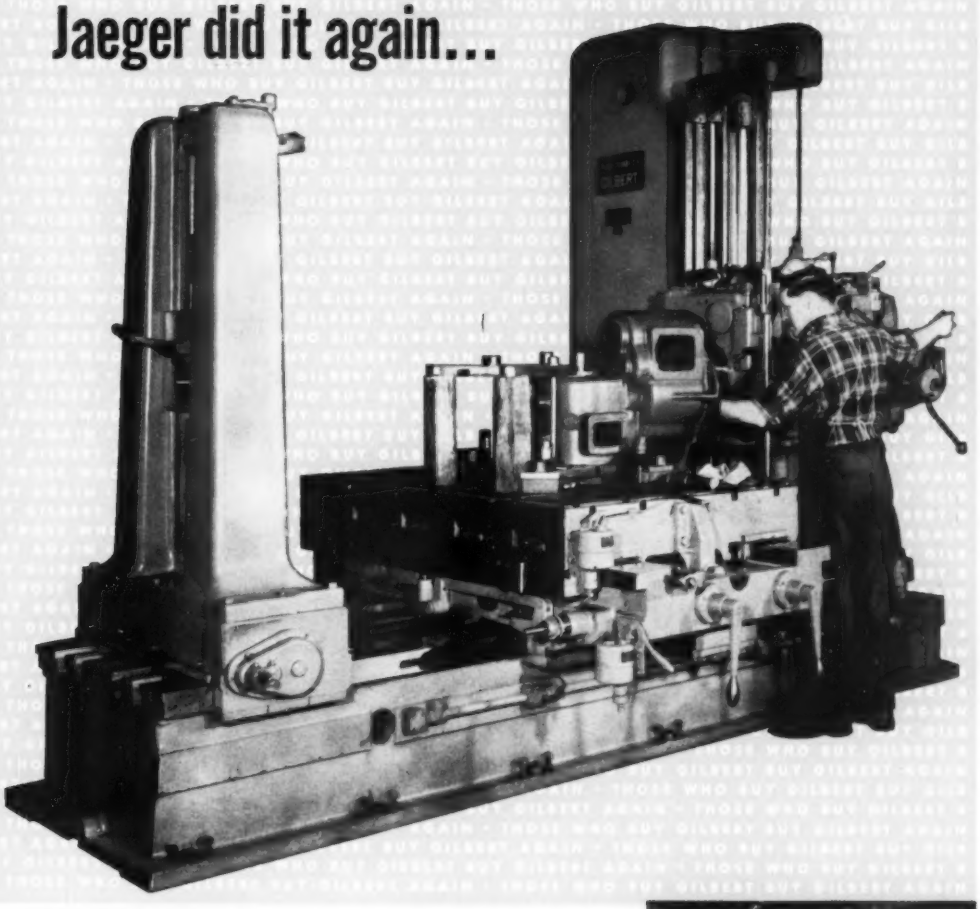
The straight, separable inner race type of construction makes possible simple methods of assembling machine parts and most efficient lubrication sealing. It also allows axial expansion or slight oscillation without cramping the roller ends.

The separable parts are freely interchangeable as any inner race will fit any roller assembly of the same number. The inner race can be omitted and the rollers operated directly upon a hardened and ground shaft.

The drawing shown above is a conventional bearing arrangement for a long shaft or roll and illustrates the application of a 6200 series bearing. All Hyatt Hy-Load Bearings are shown in our new Hy-Load Bearing Catalog, number 547. Write for your copy today. Hyatt Bearings Division, General Motors Corporation, Harrison N. J.

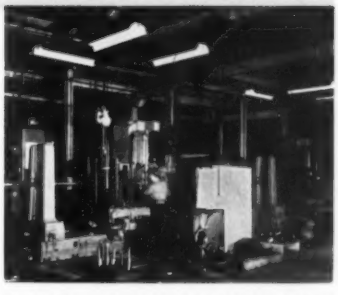
HYATT ROLLER BEARINGS

Jaeger did it again...



...five times

Shown above is one of four Cincinnati Gilbert boring mills on the job at The Jaeger Machine Co., Columbus, Ohio, well-known builder of construction machinery. A fifth is on the way. That's pretty good evidence that Gilberts pay off: Gilbert operators can *feel* the smooth precision of their machines; management can *measure* the high return per dollar invested . . . As a repeat customer, Jaeger is not alone. Better than 60% of Gilbert users have come back repeatedly for more of the same . . . Write for Bulletin 1244-B.



THE CINCINNATI

GILBERT

MACHINE TOOL COMPANY

3366 BEEKMAN STREET, CINCINNATI 23, OHIO • RADIALS • BORING MILLS • ACCESSORIES

52100 steel is ideal for all these parts

1. Diesel injection pumps
2. Lathe centers
3. Slitting rolls and knives
4. Cam rollers for automotive steering gears
5. Machine tool parts
6. Pump parts
7. Aircraft engine parts
8. Mechanical seals
9. Saw mill rollers
10. Anti-friction bearings
11. Asbestos disintegrators
12. Mill rolls

. . . and for others like them

Need a steel that's hard, tough, and easy to machine? 52100 steel is the answer. It's a high-fatigue-strength, high-tensile-strength steel that can be oil-quenched in moderate sections to a maximum hardness of Rockwell C65/66. 52100 withstands working pressures of 200,000 p.s.i. And because of its fully spheroidized structure, it offers excellent machining characteristics.

52100 steel is available in bars, tubes and wire—and The Timken Roller Bearing Company, one of the world's largest producers of 52100 steel, is the *only* source of *all three*. A wide range of sizes in each form is made to meet your needs.

We maintain a mill stock of 52100 tubing to fill small run requirements. You can select from 101 sizes, ranging from 1" to 10½" O.D. and get shipment within 24 hours after the receipt of your order. Complete, rigid quality control in the Timken Company plant assures you of uniform quality in every shipment.

Originally developed for anti-friction bearings, 52100 steel offers big advantages for any machined part requiring great strength and resistance to wear. For a stock list of available sizes, grades and finishes, write The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable address: "TIMROSCO".

YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

Specialists in alloy steel—including hot rolled and cold finished alloy steel bars—a complete range of stainless, graphitic and standard tool analyses—and alloy and stainless seamless steel tubing